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# USSR Report

CHEMISTRY

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USSR REPORT  
CHEMISTRY

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UDC 621.378.34:535.34

EFFECT OF SOLUTION COMPOSITION ON INTENSITY OF INTRARESONANT LASER  
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Moscow KHIMICHESKAYA FIZIKA in Russian No 10, Oct 83  
(manuscript received 24 Aug 82) pp 1443-1445

UDARTSEV, A. M., MASHAKOVA, S. M. and DESYATKOV, A. V., Kazakh State  
University imeni S. M. Kirov, Alma-Ata

[Abstract] Due to very small differences in the physical-chemical properties of rare earth elements, it is difficult to perform selective assay of them with sufficient sensitivity. In the present paper a method of intraresonant laser spectroscopy (IRLS) was reported as a solution to this problem. This method was described previously; in the present work a serial laser LZHI-402 was used along with the spectrograph: autocollimation camera UF-90 with a diffraction grid of 600 lines/mm. In the course of this study the effect of solvents, anions, of the ligand and of gadolinium was investigated on the detection sensitivity of Europium. It was established that in aqueous solution the intensity of  $\text{Eu}^{3+}$  absorption complexed with ethylenediaminetetraacetic acid did not depend on the  $\text{Cl}^-$ ,  $\text{NO}_3^-$  ions of the starting Europium salt. The detection sensitivity was 0.1 mg/ml. Utilization of continuous laser on a dye increased the sensitivity by 3-4 orders of magnitude, making the IRLS method a promising analytical tool. Figure 1; references 5 (Russian).  
[42-7813]

SPECTRAL MEASUREMENT OF NITROGEN, HYDROGEN AND CHLORINE IN CARBON DIOXIDE  
USING CONDENSED SPARK PLASMA

Moscow VESTNIK MOSKOVSKOGO UNIVERSITETA, SERIYA 2: KHIMIYA in Russian  
Vol 24, No 5, Sep-Oct 83 (manuscript received 10 Jul 82) pp 469-472

ZHELEZNOVA, A. A., YARMUKHAMEDOVA, N. N., KUZYAKOV, Yu. Ya.,  
TIKHONOV, A. A. and PAVLOVA, S. V., Department of Analytical Chemistry

[Abstract] Presently-used gas chromatography for analysis of gas mixtures is not sophisticated enough for low- and high-volatility gases, especially reactive, unstable and readily hydrolyzed  $\text{Cl}_2$ ,  $\text{CO}_2$  and  $\text{SO}_2$ . The present study considers a much more accurate spectral method for emission spectral measurement of nitrogen, hydrogen and chlorine in  $\text{CO}_2$  using a specially designed apparatus, which is diagrammed and described. It includes a vacuum device, electrode chambers, stimulators and a spectral instrument. Pressure is controlled with a thermocouple vacuum meter, with measurement by a U-shaped manometer. The 3-lens ISP-28 spectrograph provided the desired accuracy when measuring the spectra of  $\text{CO}_2$  plus nitrogen or hydrogen or  $\text{Cl}_2$ . The condensed spark plasma process was found to be effective in determining effects of gas mixtures as well. Figures 4; references 6: 3 Russian, 3 Western,  
[55-12131]

EVALUATION OF KRASNOGORSK COAL SUITABILITY FOR AGGLOMERATION OF  
PHOSPHORITES

Moscow KOKS I KHIMIYA in Russian No 10, Oct 83 pp 21-23

PUZANKOV, V. V., PETOKHIN, G. A., ZOTEYEVA, A. A., BOCHAROVA, E. V.,  
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[Abstract] The present laboratory study was necessitated by the search for substitutes for metallurgic coke used in production of phosphorus, particularly in agglomeration processes of small ore particles (less than 10 mm). Experiments in which enriched and crude coal from the Krasnogorsk pit of the Kuzbas was used showed that it could be used quite effectively instead of coke as the fuel for agglomeration of small size phosphorus ore. The enriched coal gave identical results as the coke; the non-enriched crude coal showed only slight drop in the effectiveness of the agglomeration process. Future studies should be performed at pilot plants concentrating on the

maximum size of the coal used, developing the firefighting safety measures and evaluating maximum permissible ash levels of the coal, which have been found to be related to acidity of phosphorus ore. The only negative aspect of these coals was the production of up to 0.6% of tarry materials (which should be reduced to zero). This problem should be solved prior to pilot plant studies. References 5 (Russian).  
[53-7813]

UDC 543.5

#### ANALYTICAL POSSIBILITIES OF GAMMA-ACTIVATION ANALYSIS BASED ON SHORT-LIVED ISOTOPES

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 38, No 10, Oct 83  
(manuscript received 20 Jan 83) pp 1758-1763

LEONARD, M., MARTYNOV, Yu. T. and TSIPENYUK, Yu. M., Institute of Physical Problems, USSR Academy of Sciences, Moscow

[Abstract] Yields of short-lived radionuclides in the process of irradiation of gamma quanta at energy of electrons of 15 Mev were studied. Basic rock-forming elements such as C, Na, O, Mg and Si are not activated at this energy. Limits of detection during analysis of pure elements according to short-lived radionuclides were assessed. Data obtained show that the standard sensitivity of most elements is  $\approx 10^{-3}$  g. The high selectivity and rapidity of the method indicate that it can be effective when used to solve many analytical problems. The limit of detection may reach  $n \times 10^{-3}$  percent and even lower, in some cases, due to the increase of power of the electron beam, the effectiveness of semiconductor detectors and optimization of time of irradiation and measurement of specific elements in samples with a mass of several grams. Figures 2; references 9: 7 Russian, 2 Western.  
[70-2791]

UDC 543.544.001.5

#### INCREASE OF SPECIFICITY AND STABILITY OF DUAL FLAME DETECTOR OF SURFACE IONIZATION

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 38, No 10, Oct 83  
(manuscript received 10 May 82) pp 1773-1777

SOTNIKOV, Ye. Ye., BABANOV, N. I. and VOLKOV, S. A., Scientific Research Physicochemical Institute imeni L. Ya. Karpov, Moscow

[Abstract] Basic characteristics of a dual flame detector of surface ionization (DPVID) which permits selective determination of nitrogen-containing, phosphorus-containing and halogen-containing compounds were expanded to

include additional recording of flame emission of the lower burner in order to increase the specificity of this detector in relation to sulfur-containing compounds. A schematic diagram of the device is presented; it is described and the method of operation is discussed. Use of the DPVID made it possible to determine, selectively, sulfur-containing compounds as well as nitrogen-, halogen- and phosphorus-containing compounds. The sensitivity for sulfur-containing compounds at a transmission wave length of 395 nm is  $3 \cdot 10^{-9}$  g. Figures 3; references 5: 2 Russian, 3 Western.  
[70-2791]

UDC 543.53:(546.14:546.15)

#### RADIOCHEMICAL DETERMINATION OF BROMINE WITH AID OF RADIONUCLIDE $^{131}\text{I}$

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 38, No 10, Oct 83  
(manuscript received 3 Jun 82) pp 1819-1825

SHAMAYEV, V. I. and MALYSHEVA, A. O., Moscow Chemical Engineering Institute  
imeni D. I. Mendeleev

[Abstract] An interpolation method of analysis with the use of non-isotopic indicators, which is used to determine bromide with the aid of  $^{131}\text{I}$ , is described and discussed. The limit of detection of bromine by the method is approximately 0,2 mcg/ml. The radiochemical procedure determines bromine in the presence of a 1000-fold excess of chlorine. Figures 1; references 12: 9 Russian, 3 Western.  
[70-2791]

UDC 543.8:543.38:615.33

#### STUDY OF PRECIPITATION OF AMINOGLYCOSIDE ANTIBIOTICS BY AZO COMPOUNDS

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 38, No 10, Oct 83  
(manuscript received 16 Aug 82) pp 1856-1861

ALYKOV, N. M., FEKLISTOVA, N. A., ALYKOVA, T. V. and KAMZEL', T. V.,  
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[Abstract] Study of precipitation of some aminoglycosides by azo compounds and a procedure for determining 0.01 to 100 mcg of aminoglycoside antibiotics with the use of Erichrom Black T were described and discussed. Monomycin, kanamycin, streptomycin and gentamycin, precipitated with azo compounds from slightly acid aqueous solutions, were studied. Slightly soluble compounds with an antibiotic:azo compound ratio from 1:1 up to 1:5 were formed at pH 3 according to the number and position of hydrophilic groups in the azo compound molecules and the number of amino groups in the aminoglycoside molecules. The method for using Erichrom Black T to determine the amino

glycoside antibiotics was described and results obtained by its use are presented in tables, described and discussed. Figures 6; references 6 (Russian).  
[70-2791]

UDC 542,61+546.791:547.333

STUDY OF EXTRACTION PROPERTIES OF UNSATURATED AMINES, PART 2: EXTRACTION OF URANIUM(VI) FROM SULFURIC ACID SOLUTION WITH AMINES OF PIPERILENE DERIVATIVES

Tallinn IZVESTIYA AKADEMII NAUK ESTONSKOY SSR in Russian Vol 32, No 4, Oct-Nov-Dec 83 (manuscript received 19 Apr 82) pp 268-271

TIMOFEYEVA, N., RANG, Kh. and VIYTMAA, Sirje, Institute of Chemistry, ESSR Academy of Sciences

[Abstract] The present article reports study of the extraction properties of unsaturated amines of piperilene derivatives (APP). The latter were synthesized by amination of products of telomerization of piperilene and its hydrochloride. Uranium extraction was accomplished with 0.1 mole solutions of APP in kerosene, or with unpurified products of amination of piperilene halogen derivatives. Results showed that the capacity of APP for carrying uranium(VI) increased as their solubility decreased. At maximum capacity in a saturated organic phase, the amine:uranium ratio was 6:1. The distribution coefficient of uranium increased to an upper limit as the uranium content of the aqueous phase was reduced. Figures 4; references 6: 5 Russian, 1 Western.  
[65-12131]

## CATALYSIS

UDC 547.592.3:542.941

### CATALYTIC PROPERTIES OF COMPLEXES FORMED BY POLYETHYLENEIMINE WITH RHODIUM AND RUTHENIUM CHLORIDE

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 272, No 6, Oct 83  
(manuscript received 25 Feb 83) pp 1379-1381

ABUBAKIROV, R. Sh., SYTOV, G. A., PERCHENKO, V. N., OMARALIYEV, T. O. and NAMETKIN, N. S., corresponding member, USSR Academy of Sciences, Institute of Petrochemical Synthesis, USSR Academy of Sciences, Moscow

[Abstract] Studies were conducted on the catalytic properties of complexes formed between polyethyleneimine with either rhodium or ruthenium chloride in promoting hydrogenation of 1,3-pentadiene (PD) at 20-60°C with H<sub>2</sub> or NaBH<sub>4</sub> as reducing agents. Complex formation was achieved by mixing the imine (10<sup>-4</sup> M) with either chloride at nitrogen:metal ratios of 2:1 and 4:1. The resultant metallocomplexes were virtually insoluble in water and aqueous alcohol and were stable at 140-230°C. The rhodium complexes showed little specificity in hydrogenation of PD, with pentane accounting for 16 to 34% of the products, 1-pentene 15-32%, trans-2-pentene 40-41%, and cis-2-pentene 11-16%. Reaction with the ruthenium complexes was much faster and, as PD was used up, the products 1-pentene and trans-2-pentene were hydrogenated, while the concentration of the cis-2-pentene product remained constant. These observations indicate that polynuclear complexes based on polyethyleneimine constitute catalytic systems whose properties are determined by the chelated metal and the ratio of donor nitrogen atoms to metal atoms. Figures 1; references 11: 10 Russian, 1 Western.  
[58-12172]

RESULTS OF INDUSTRIAL RESEARCH STUDIES OF CATALYTIC PURIFICATION METHOD OF GASEOUS DISCHARGE

Moscow KOKS I KIMIYA in Russian No 10, Oct 83 pp 53-55

MALYSH, A. S., KUPRYAKHINA, K. Z., PAPKOV, G. I., UKhin [Scientific Research Institute of Coal Chemistry] and KANTSEDAL, L. D., Kharkov, Coke-Chemical Plant

[Abstract] Results were reported of industrial-experimental studies concerned with catalytic purification of noxious substances at the Khar'kov coke-chemical plant. The purification step was performed over a single copper-chromium catalyst or on a two-layer unit consisting of the same copper-chromium unit and a specially treated VKSh-65 catalyst. Over these catalysts, aromatic hydrocarbons and phenol were converted to  $\text{CO}_2$  and  $\text{H}_2\text{O}$ ; ammonia and HCN were oxidized to  $\text{CO}_2$ ,  $\text{N}_2$  and  $\text{H}_2\text{O}$ ; and  $\text{H}_2\text{S}$  was converted to sulfur dioxide. These reactions were practically quantitative at temperatures of 450-500°C. To achieve optimal performance, a 3:1 VKSh-65:CuCr combination of the two-layer catalyst was used. Figures 2; references 3 (Russian). [53-7813]

UDC 539.89 + 541.128.35

EFFECT OF HIGH STATIC PRESSURES IN COMBINATION WITH SHEARING DEFORMATIONS ON ACTIVITY OF Pt/MeFe<sub>2</sub> TYPE CATALYSTS (Me= Mg, Ca, Sr, Ba)

Moscow KHMICHESKAYA FIZIKA in Russian No 10, Oct 83  
(manuscript received 17 Feb 82) pp 1440-1441

BATSANOV, S. S., BOKAREV, V. P., BOKAREVA, O. M., BONDAREV, Yu. M., MARDASHEV, Yu. S. and SEMIN, V. P., All-Union Scientific Research Institute of Physical-Technical and Radio-Technical Measurements, Mendeleyevo

[Abstract] The effect of shearing deformations at high pressures on catalytic activity of platinum deposited over alkaline earth fluorides was studied in cyclohexane dehydrogenations. Analysis of experimental data showed that shearing deformations led to a two-orders-of-magnitude increase in dislocation densities of the support material, accompanied by increased catalytic activity of these samples. Overall, this could be due to an increase in specific surfacd of platinum. Thus the use of high pressure to cause shearing deformations in platinum catalysts is an effective means of increasing their catalytic activity. References 6: 5 Russian, 1 Western. [42-7813]



## ACTIVE ELECTRODES BASED ON SKELETAL NICKEL-COBALT CATALYST FOR WATER ELECTROLYSIS

Moscow ELEKTROKHIMIYA in Russian Vol 19, No 10, Oct 83  
(manuscript received 12 May 82) pp 1328-1331

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[Abstract] The use of surface skeletal catalysts (SSC) improves substantially electrochemical characteristics of electrodes used in water electrolysis. Chemically-precipitated alloy consisting of nickel and cobalt (65% Co) lowered the overvoltage for oxygen generation. A new method was developed for activation of wire gauze electrodes used in generation of hydrogen and oxygen by means of galvanic precipitation of nickel-cobalt alloys, from sulfamineoxide electrolyte, onto the electrode base followed by calorizing and leaching process. Under these conditions, skeletal Ni-Co catalyst is formed on the wire gauze with specific surface of up to  $120 \text{ m}^2/\text{g}$ . Electrodes with 10% Co content showed the highest activity. It was shown that preliminary thermal treatment of SSC-containing electrodes in hydrogen atmosphere increased the strength of the catalyst layer by an order of magnitude, prolonging the performance of these electrodes under practical conditions without lowering their electrochemical characteristics. Figures 5; references 7: 6 Russian, 1 Western.  
[56-7813]

## ADSORPTION AND CATALYTIC PROPERTIES OF IRON-COPROPORPHYRIN III COMPLEX IN OCTANE/WATER INTERFACE

Moscow ELEKTROKHIMIYA in Russian Vol 19, No 10, Oct 83  
(manuscript received 25 Jun 82) pp 1398-1401

VOLKOV, A. G., BIBIKOVA, M. I., MIRONOV, A. F. and BOGUSLAVSKIY, L. I.,  
Institute of Electrochemistry, USSR Academy of Sciences, Moscow and  
Institute of Fine Chemical Technology imeni M. V. Lomonosov, Moscow

[Abstract] Metal-porphyrin catalyzed oxidation-reduction reactions at the interface between two immiscible liquids were studied by comparing data obtained with a vibrating electrode with data from adsorption electrode. The catalyst consisted of an iron complex of tetramethyl ester of coproporphyrin III. The experimental data obtained showed that using the adsorption isotherm along with the obtained values of the volt-potentials, one could study the physical-chemical state of the catalyst molecules at the

interface and determine the Michaelis constant. The data obtained agreed well with a model developed in an earlier study for catalytic charge transfer through the interface between two immiscible fluids. Figures 3; references 10: 7 Russian, 3 Western (1 by Russian authors).  
[56-7813]

UDC 547.724.1

#### OXOCATIONIC SALTS AS CATALYSTS IN PRODUCTION OF FURAN ALDEHYDE

Riga KHIMIYA DREVESINY in Russian No 5, Sep-Oct 83 (manuscript received 18 Mar 82) pp 90-93

KRUPENSKIY, V. I., Ukhtinsk Industrial Institute

[Abstract] A series of kinetic experiments was carried out designed to determine catalytic activity of  $TiO^{2+}$  in dehydration reaction of xylose and glucose. In the temperature range studied (130-150°C) the breakdown of sugars occurred by the first order reaction up to 70-80% conversion. The coefficient of catalytic activity for  $TiO^{2+}$  was found to be very high, i.e. 8.0, which would make it a good catalyst; except for the low yield of the final product. Only furfural was obtained in adequate yields from xylose; other products obtained in lower yields were: formic, pyromucic, glycolic, glyceric and succinic acids. Experiments were performed attempting to obtain furfural from natural products: corn husks and birch shavings. The starting material was finely ground, wetted with 0.6-1.0%  $TiO_2$  solution in 3-5%  $H_2SO_4$  and reacted at 160°C, steamdistilling the final product. The process showed advantages over the traditional synthetic routes. The most suitable catalyst for production of hydroxymethylfurfural from glucose was  $ZrOCl_2$ . Figures 4; references 9 (Russian).  
[40-7813]

UDC 541.135.5 - 183:546

#### HYDROGEN ADSORPTION ON SKELETAL CATALYSTS OF PALLADIUM-RHODIUM SYSTEMS

Moscow VESTNIK MOSKOVSKOGO UNIVERSITETA, SERIYA 2: KHIMIYA in Russian Vol 24, No 5, Sep-Oct 83 (manuscript received 9 Jul 82) pp 477-480

GRISHINA, T. M., LAZAREVA, L. I. and VOVCHENKO, G. D., Department of General Chemistry

[Abstract] The present study considers hydrogen adsorption on skeletal palladium, rhodium and palladium-rhodium catalysts with widely varying composition, using galvanostatic charge curves in  $H_2SO_4$  and  $HCl$  at 20°C. The resulting data showed that where more than 50% rhodium was present, various electrolytes brought strikingly different adsorption properties.

For example, chloride ions blocked active centers on the catalysts' surface and sharply reduced hydrogen adsorption. Less was adsorbed in a solution of HCL than with  $H_2SO_4$ . Maximum mean surface was reached with 10% palladium and the minimum value was found with only palladium as the catalyst. Figures 3; references 10 (Russian).  
[55-12131]

UDC 541.128:542.941.7

#### BEHAVIOR OF RANEY Cu-Pd CATALYSTS IN ENANTIOSELECTIVE HYDROGENATION

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 10, Oct 83 (manuscript received 21 Feb 83) pp 2206-2210

VEDENYAPIN, A. A., KUZNETSOVA, T. I., KLABUNOVSKIY, Ye. I.,  
AKIMOV, V. M., GORINA, N. B., POLYAKOVA, V. P. and ZYKOVA, Ye. V.,  
Institute of Organic Chemistry imeni N. D. Zelinskiy, USSR Academy of Sciences, Moscow

[Abstract] The behavior of skeletal (Raney) Cu-Pd catalysts with respect to hydrogenation of ethyl acetoacetate was studied in relation to phase composition and adsorptive capacity of the catalysts, and the rate of hydrogenation per  $1\text{ m}^2$  of Pd. Adsorption of hydrogen in 0.1 N sulfuric acid showed a marked decrease in adsorption for catalysts with 5.1 atom% Pd (Cu;Cu-Pd;  $Al_2O_3 \cdot 3H_2O$ ) and 15.1 atom% Pd (Cu;Pd; $Al_2O_3 \cdot 3H_2O$ ) in the metallic phase. Maximum hydrogen adsorption was seen with the 100 atom% Pd (Pd; $Al_2O_3 \cdot 3H_2O$ ) catalyst, which also yielded the highest rate of ethyl acetoacetate hydrogenation at  $100^\circ\text{C}$  under 100 atm. per 1 g of the catalyst. Studies with tartaric acid-modified catalysts showed that those with 5 atom% Pd or less were enantioselective in ethyl acetoacetate hydrogenation, and that the degree of selectivity was inversely proportional to the Pd content. Figures 4; references 4 (Russian).  
[67-12172]

$^{13}\text{C}$  AND  $^{17}\text{O}$  NMR SPECTROSCOPY OF SELECTED  $\alpha$ -CHLOROETHERS

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian  
No 10, Oct 83 (manuscript received 1 Apr 82) pp 2265-2269

ARBUZOV, B. A., BREDIKHIN, A. A., YENIKEYEV, K. M., ISMAYEV, I. E.,  
IL'YASOV, A. V. and VERESHCHAGIN, A. N., Institute of Organic and Physical  
Chemistry imeni A. Ye. Arbuzov, Kazan Branch, USSR Academy of Sciences

[Abstract]  $^{13}\text{C}$  and  $^{17}\text{O}$  NMR studies were conducted on 15  $\alpha$ -chloromethyl-,  
 $\alpha$ -chloroethyl-, and  $\alpha,\alpha$ -dichloromethyl ethers, with the data on the chemical  
shifts summarized in tabular form ( $\delta^{13}\text{C}$ ,  $\delta^{17}\text{O}$ ). Evaluation of the spectral  
data on the chemical structures of the molecules under study and the manner  
in which the different groups influence the absorption line of one another  
indicated that, in the  $\alpha$ -monochloro alkyl ethers, the C-Cl bond exists largely  
in the gauche conformation. In the  $\alpha,\alpha$ -dichloroalkyl ethers, in addition  
to the predominant gauche conformation of the C-Cl bond relative to the C-O  
bond, there is a considerable gauche,trans component. References 16:  
6 Russian, 10 Western.  
[67-12172]

MOLECULAR AND CRYSTALLINE STRUCTURE OF 4,6-DIMETHYL-2,6-DIPHENYL-1-PHOSPHA-  
2,3-DIAZABICYCLO[3.1.0]HEXENE-3

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 10,  
Oct 83 (manuscript received 26 Jan 83) pp 2275-2279

LITVINOV, I. A., STRUCHKOV, Yu. T., ARBUZOV, B. A., DIANOVA, E. N. and  
ZABOTINA, Ye. Ya., Institute of Heteroorganic Compounds  
imeni A. N. Nesmeyanov, USSR Academy of Sciences, Moscow; Chemical Institute  
imeni A. M. Butlerov, Kazan State University

[Abstract] X-ray structural studies and EPR and NMR spectroscopic examinations  
were conducted on 4,6-dimethyl-2,6-diphenyl-1-phospha-2,3-diazabicyclo[3.1.0]-  
hexene-3 (I) synthesized by the reaction of methylphenyldiazomethane with  
5-methyl-2-phenyl-1,2,3-diazaphosphole. Evaluation of the data on the tri-  
clinic crystals of I yielded information on the valency and torsion angles,  
as well as the bond lengths; this is summarized in tabular form. In one  
of the two geometric isomers short intermolecular nonvalent contacts between  
P atoms were on the order of 3.483 Å and were ascribed to distorted  
van der Waals radii of the P atoms. Figures 1; references 9: 4 Russian,  
5 Western.  
[67-12172]

CATALYSIS BY PLATINUM COMPLEXES OF ALCOHOL OXIDATION IN ROH-H<sub>2</sub>O-I<sub>2</sub> SYSTEMS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 53, No 10, Oct 83  
(manuscript received 22 Mar 83) pp 2393-2394

KUKUSHKIN, Yu. N., DEMIDOV, V. N. and FEDYANIN, N. P., Leningrad  
Technologic Institute imeni Lensovet [Leningrad Soviet]

[Abstract] Spectrophotometric studies on the oxidation of saturated alcohols in ROH-H<sub>2</sub>O-I<sub>2</sub> (ROH: C<sub>n</sub>H<sub>2n+1</sub>OH, n = 2-6) systems catalyzed by Pt halide and aminate complexes, in combination GLC analysis of the products, demonstrated that the alcohols are largely oxidized into esters (C<sub>n</sub>H<sub>2n+1</sub>COC<sub>n-1</sub>H<sub>2n-1</sub>) with 90% I<sub>2</sub> → HI conversion under air or argon. In the

case of ethanol oxidation the complexes ranked as follows in activity:  
[PtX<sub>6</sub>]<sup>2-</sup> > [PtX<sub>4</sub>]<sup>2-</sup> > trans-[PtPy<sub>2</sub>X<sub>4</sub>] >> [PtPy<sub>4</sub>]<sup>2+</sup> (X = Cl, Br or I; py = C<sub>5</sub>H<sub>5</sub>N).  
References 1 (Western).  
[68-12172]

## CHEMICAL INDUSTRY

### INTEGRATED SPECIAL-PURPOSE PROGRAMS FOR CHEMISTRY

Moscow KOMPLEKSNIYE TSELEVYYE PROGRAMMY PO KHIMII (NOVOYE V ZHIZNI, NAUKE, TEKHNIKE: SERIYA "KHIMIYA") in Russian No 10, Oct 83 (signed to press 30 Sep 83) pp 2-9, 58-63

[Annotation by E. G. Rakov, doctor of chemical sciences, member of the Office of the Department of Dissemination of Chemical Information under the All-Union "Znaniye" Society, introduction, article and table of contents from book "Integrated Special-Purpose Programs for Chemistry (News in Life, Science and Technology: Chemistry Series)", by Kirill Mikhaylovich Dyumayev, doctor of chemical sciences, professor, deputy chairman of the USSR State Committee for Science and Technology, author of more than 300 scientific publications, Izdatel'stvo "Znaniye", 28,840 copies, 64 pages]

[Text] The USSR State Committee for Science and Technology, USSR Gosplan and USSR Academy of Sciences have prepared a set of scientific-engineering programs, the ultimate purpose of which is full-scale implementation in the national economy of the most economically effective achievements of science and technology. This pamphlet discusses the national economic problems, to which chemical science can and should make a contribution. This publication is intended for lecturers, propagandists, instructors and students at people's universities, all those interested in the problems and achievements of modern chemical science and industry.

#### Introduction

At all stages of economic building, the Communist Party and Soviet government devoted much attention to development of industry. The prewar five-year plan, which was declared the Five-Year Plan of Chemistry, was interrupted by the invasion of our country by fascist Germany. The unprecedented wartime tribulations that followed and restoration of the devastated national economy postponed fulfillment of the plans for many years.

Today's Soviet chemical industry can give an accounting of its activities starting with the May (1958) Plenum of the CPSU Central Committee, when the decree was adopted "On accelerating development of the chemical industry and, particularly, production of synthetic materials and products made from them to satisfy the demands of the public and needs of the national economy." Much has been accomplished in this time. For example, the share of fixed capital

constituted almost 90%, production of the principal types of chemical products increased by about 10 times, and by more than 14 times for plastics and synthetic resins, whereas for some products, including synthetic detergents, by more than 50 times.

In the last 25 years, the rate of development of the chemical industry consistently overtook the rate of development of industry as a whole. In this period, the volume of output of products by the chemical and petrochemical industry increased by more than eight times. In the years of the last two five-year plans alone, there was almost 3-fold increase in output of mineral fertilizers, and already in 1973 the USSR advanced to first place in the world in overall volume of production of this item. In this time, production of synthetic resins and plastics increased by 3.5 times, output of chemical fibers and thread by almost 2.3 times, with considerable increase in output of other extremely important types of products. Major changes took place in the structure of production, in the direction of increasing output of progressive types of products. There has been expansion and qualitative change in the raw materials base of the sectors.

Under the 10th Five-Year Plan, in accordance with programs dealing with work on scientific and engineering problems, almost 350 new types of products and materials were developed, as well as about 200 technological processes new to our chemical industry.

Among the most important research projects, we can mention development of the process of recovery of concentrated and long-acting, slowly dissolving mineral fertilizers, such as carbamide-formaldehyde fertilizers (CFF). In 1980, construction of an experimental production facility for CFF production was completed. As a result of the work that was done, the technology of production was refined on an experimental production scale and, on the basis of data obtained at this installation, industrial production is being introduced. A process has been developed for the production of wet-process phosphoric acid and ammophos [ammonium phosphate fertilizer] from the lean ore recovered at the Karatau and Chilisay mines, which augmented considerably the raw materials base for production of phosphorus-containing fertilizers.

In accordance with the programs, a highly efficient process was developed for production of sulfuric acid from sulfur under pressure. The automated process and equipment for chlorine and caustic soda production, with use of bipolar bag-type electrolyzers, are important.

Work has been completed on development of new brands of polymers and highly efficient technological processes for production of heavy duty plastics and synthetic resins. Output of batches of polymers such as polysulfone, polyphenyloxide, optical polycarbonate and several other polymers with a set of specified properties has been organized.

Production of thermoplastic pipes has started for the first time in the USSR at specialized mechanized plants. The entire technological process is automated, so that it was possible to put out the first 80,000 tons of pipes and fittings for them as early as 1980.

We must mention the successful fulfillment of program tasks by the Institute of Mechanics of Metal-Containing Polymers, Belorussian Academy of Sciences. This institute developed and has successfully tested under various industrial conditions a lubricant based on polymers, which also protects metal surfaces against corrosion. This lubricant has been tested on the railroad to protect the switching signals from fading. The results of the tests revealed that use of the new lubricant assures their reliable operation for an entire year.

For the first time in worldwide practice, the All-Union Scientific Research Institute of Synthetic Fibers, Moscow State University and Institute of High Molecular Compounds, USSR Academy of Sciences, developed and tested under experimental conditions some basically new technological methods of producing high-strength combined synthetic thread and monofilament twice as strong as synthetic thread produced from the same polymers by the traditional method. The solution of this problem made it possible to start industrial production of hay-baling cord during the period of the 11th Five-Year Plan, which eliminates the use of metal tape to bale hay.

Good achievements have been made in the area of developing paints. For example, 18 brands of paint are now being produced. Industrial production of five cation dyes in liquid form has been adopted, for painting synthetic thread of the "nitron" type. Production of black pigment based on commercial carbon has been started at the "Paint" Scientific Production Association in Rubezhnoye.

Among the work projects accomplished following the scientific and engineering programs of the USSR Ministry of the Petrochemical Industry, we should mention, first of all, the new technological oil refining processes, which are aimed at increasing the depth of processing petroleum on large installations.

For the first time in the USSR, the technology was developed and experimental production set up of new emulsion lubricant and cooling fluids containing polymer-forming additives at the Perm Oil Plant. These fluids are used in cold metal cutting. Some of them are superior to their foreign analogues.

A technological process has been developed and assimilated for industrial production of an improved grade of SKI-3 polyisoprene rubber, which solves a number of problems advanced by consumers and will reduce even more the outlay of natural rubber in the tire industry. Use of rubber based on SKI-3 rubber of an improved molecular structure in the tire industry will yield a saving of tens of millions of rubles to the national economy, provided the synthetic rubber industry switches completely to its production. A new modification of polyisoprene, which was developed and is now in production, is put out only in our country.

The Scientific Research Institute of the Tire Industry has developed the 165/80-r-13 tire with metal cord in the breaker (padded layer between the body and tire guard of the automobile, which protects the body from destruction) for the VAZ-2102, VAZ-2103, VAZ-2106 and Moskvich-2140 motor vehicles. The specifications of the new tire are on a par with the best foreign specimens.



Considerable work was done in the area of protecting metals against corrosion. Series of protective technological surface materials have been developed, which provide for nonoxidative heating of metal in hot deformation and heat treatment in ordinary furnaces with an oxidative atmosphere for a wide range of temperatures. It was found that the developed topcoats also serve as lubricant in hot deformation of metal, spontaneously separating with the parts when cooled after hardening. They are also attractive because they are made of inexpensive components that are plentiful. At the present time they have found rather broad application.

Heat resistant enamels have been developed as a result of a set of scientific investigations and introduction of new materials; these enamels are designed to protect parts of engines and apparatus operated in the presence of high-temperature aggressive media, erosive gas flow, etc. As a result of using these topcoats, the reliability of operation of engines and separate units is improved, it is possible to design parts that retain efficiency at temperatures in excess of 1000°C.

Assimilation of production of the newly developed chemical products and materials, as well as introduction of highly efficient technological processes, enabled the chemical industry to improve the technical sophistication of the most important types of products, while the research work prepared for implementation of programs of experimental design work under the current five-year plan.

In accordance with the "Basic directions of economic and social development of the USSR in 1981-1985 and for the period up to 1990," there are plans for increasing the rate of development of the chemical industry under the 11th Five-Year Plan also.

At the present time, under conditions of the modern scientific and technological revolution, there has been immeasurable increase in importance and role of chemical science and industry. Even now, it is impossible to conceive of a national economy without the new synthetic materials developed by chemistry. They are used extensively in machine building and agricultural production, in space and under water, in construction and transportation, in the doctor's office, in the scientist's laboratory and in the home. Chemical science is playing an important role in development of modern technology, development of physics and biology, while the chemical industry plays such a part in solving problems of the national economy related to back-up of agroindustrial and energy-fuel complexes, machine building and metallurgy, transportation and construction, production of consumer goods. Chemistry has a revolutionizing influence on acceleration of scientific and technological progress for the national economy as a whole.

Early in the course of preparations for the 26th Party Congress, the USSR State Committee for Science and Technology, together with the USSR Academy of Sciences and USSR Gosplan, began to develop plans for new technology. Consideration was given to the principal factors that make it difficult for our economy to develop, such as reduction of the increment in manpower, the more difficult and expensive extraction of minerals and their subsequent processing,

the increasing distance of the principal deposits from the sites of industrial processing of raw material and main industrial centers, the need for increased expenditures for protection of the environment which together lead to drastic increase in material expenditures on transportation of raw material and energy carriers. In addition, there are quite a few enterprises that require technical retooling and reconstruction. In other words, in the presence of increasingly complicated objective factors, the turn to intensive methods of management of the national economy outlined by the party has no alternatives.

In view of the wide range of tasks put to the national economy, the USSR Gosplan, USSR State Committee for Science and Technology and USSR Academy of Sciences have approved 170 scientific and technical programs of utmost importance, including 42 special-purpose ones. In the area of chemistry and chemical machine building, 25 scientific and technical programs have been approved, including 7 special-purpose integrated scientific and technical programs, which constitutes 11.7% of all approved programs. They are an integral part of the 11th Five-Year Plan. Of this total number of programs, special-purpose integrated scientific and technical programs have been singled out, the fulfillment of which, including organization of series production, will yield a considerable economic effect, already in the period of the current five-year plan. At the same time, a full volume of production will be achieved in a number of areas under the 12th Five-Year Plan.

The scientific and technical programs approved in 1981 were tied in, for the first time, with plans of financing and maximum supply of all resources over the entire chain, from research to setting up production. The necessary allocations have been made for their special implementation.

The question could be posed: Why is so much attention and importance being given at the present time to scientific and technical programs? The scientific and technical programs are called upon to create new technologies and products with less expenditure of labor and material per production unit, better consumer features and large usage. Expressly scientific and technical programs are called upon to make up for the growth of expenses referable to factors that make it more difficult to develop, overcome them and aid in accelerated growth of the national income. Fulfillment of the programs will solve the principal problem put to all of us by the 26th CPSU Congress: further improvement of welfare of the Soviet people.

The special-purpose integrated scientific and technical programs provide for the full cycle of development and assimilation of new equipment and technology, from scientific research to production of new products. Measures will also be implemented to solve problems and introduce new equipment and technologies in the specified scope, including development of production capacities, construction of new plants and renovation of existing ones.

It is important to mention that the administrators of special-purpose integrated scientific programs have been appointed and the staff of coordinating councils confirmed by decree of the USSR State Committee for Science and Technology, USSR Gosplan and Presidium of the USSR Academy of Sciences. As a rule, responsible officials of ministries and agencies, as well as prominent scientists of our country, are appointed as program administrators.

It was determined by the decree that program administrators and members of coordinating councils implement organizational and methodological supervision of projects, monitor the progress of fulfillment of programs and, together with ministries, agencies and organizations that are doing the work, take the necessary steps to complete the assignments provided in the programs, as well as assure a high level of technical and economic sophistication in the new equipment and technology.

Equally serious problems are put in the most important scientific and technical programs developed by the State Committee for Science and Technology, together with ministries and agencies, which are part of the State National Economy Plan in the section entitled "Development of Science and Technology." Elaboration of programs is aimed at solving the problems that determine the general development of social and economic issues.

Special-purpose integrated programs in the field of chemistry are concerned with recovery of synthetic liquid fuel and alternative types of fuel, superstrong fibers, new catalysts, heavily loaded polymers and composition materials, light-duty chemical products, chemical and biological means of protecting plants and animals. We shall dwell briefly on each of them individually.

News about the Exhibition of Achievements of the National Economy of the USSR  
(Based on Information About Various Exhibits and Inspections)

●A new, larger combined unit was developed for processing petroleum, LK-8, which combines six processes simultaneously. In the treatment process, a new (polymetal) reforming catalyst is used. The unit is intended for combined processing of oil with recovery of marketable products: high-octane components of gasoline for motor vehicles, hydrorefined kerosene and constituents of diesel fuel, liquefied gases and boiler fuel.

The annual economic effect of introduction of this unit will be 7.4 million rubles.

It was developed by the Lenneftekhim [Leningrad Petrochemical] Scientific Production Association (SPA).

\* \* \*

●The process of recovering copolymer ABS on the basis of styrene, acrylonitrile and butadiene rubber consists of continuous radical polymerization in the mass of constituents. The mass polymerization process provides for high productivity and yields a polymer with low residual monomer content.

As compared to the emulsion method that is used, production of ABS by the method of polymerization in mass is notable for the fact that there is one-half fixed capital expenditure and higher (3-fold) productivity of labor. The cost of the product is 15% less. The polymer is used in instrument building, radio engineering, as well as in the manufacture of motor vehicle parts and consumer goods.

The annual economic effect of this process, which runs at the rate of 30 tons/year, will be 5 million rubles.

It was developed by the Plastopolymer SPA in Leningrad

●Heavily loaded fibers have been developed that have ion exchange and adsorption properties, which are intended for purification of industrial gases and waste (from chlorine, hydrogen chloride, ammonia, etc.), purification of ventilation gases, liquids, protection of respiratory organs, etc. They are notable for low cost and high bulk properties.

This development is protected by USSR author certificate No 672930, patent applications No 109106 in the United States and No 55-13-738 in Japan.

The expected economic effect is 20,000 rubles per ton material.

The developer is the All-Union Scientific Research Institute of Synthetic Fibers (VNIISV).

●A general purpose aqueous hardening medium based on iron-containing polyacrylic acid is used for heat treatment of metals, instead of the mineral oils in current use. It works stably over a wide range of temperatures and is suitable for hardening items of all sorts of dimensions made of different grades of steel. Its use instead of mineral oil provides for a good quality of hardened items, safety of shops against fire and eliminates the need for cleaning the hardened items or quenching baths to remove burn-on.

It is produced by the "Kirov Plant" PA [production association] (in Leningrad) and Irkutsk Institute of Organic chemistry, Siberian Department of the USSR Academy of Sciences.

\* \* \*

●Nonmetal rust-resistant materials and coatings constitute 80% of the materials used to protect metals against corrosion. Paint and varnishes constitute 65% of the protective and ornamental coatings for metal.

●Chemically stable composition plastics are intended to protect technological equipment against chemically active media. They operate over a wide range of temperatures and loads, in aggressive media, with high loads in the presence of friction with sparse lubrication (for plain bearings). They do not require heat treatment and are applied in a minimal number of coats (2-3). There are no solvents among the constituents of the initial compositions. These plastics are superior to textolite, glass-reinforced plastic and cardboard in resistance to water and heat; they are superior to nonferrous metals and their alloys, and to textolite [resin-impregnated fabric laminate] in anticorrosive properties. Secondary raw material is used. In 1981, the plastics started to be used at the Dnepropetrovsk Metallurgical Plant imeni Komintern and the Novolipetskiy Metallurgical Plant.

The annual economic effect is 173,000 rubles.

They were developed and produced by DKhTI [Dnepropetrovsk Institute of Chemical Technology?].

●Use of polymer powders to paint parts and units of medical equipment instead of type ML-12 enamel resulted in the following: prolonged shelf life of the coating by 2-3 times; reduced to two-fifths to one-third the outlay of paint and varnish; reduced to one-third to one-fourth the time consumed on painting; improved sanitary and hygienic working conditions and reduced environmental pollution.

The annual economic effect at the Belgorod-Dnestr Instrument Plant constituted 160,000 rubles.

They were developed by the "Medoborudovaniye" [Medical Equipment] SPA and the "Lakokraspokrytiye" [Paint and Varnish] SPA.

●Kubogens constitute a new group of water-soluble dyes. They are intended for dyeing cotton, linen and viscose-staple fabrics, and they are also used in printing. They are produced in powder and paste form. They are characterized by high stability indicators and are as good as the most stable vat dyes.

The economic effect of producing 250 tons of dye per year is about 10 million rubles.

They were developed by the Scientific Research Institute of Organic Intermediates and Dyestuffs (NIOPiK) in Moscow and the Rubezhnoye Branch of NIOPiK.

\* \* \*

●In 1982, 78,000 tons of rubber waste, 45,600 tons of rubber fabric waste, 21,700 tons of slaty heavy coal-tar products and 200,000 tons of worn tires were processed at enterprises under the USSR Ministry of the Petrochemical Industry.

●Use of recycled water has increased to 75% as a result of adopting low-waste and wastefree technological processes in treatment of waste at enterprises of the USSR Ministry of the Chemical Industry. Valuable components worth 40 million rubles are recovered annually from industrial waste and discharges.

●A new technological process was developed for recovery of pigmented magnesium titanate.  $MgTiO_2$  is used for production of more reflective coatings than  $TiO_2$ . Pigment is obtained by the calcination method from magnesium carbonate and titanium dioxide with addition of substances that accelerate interaction between the initial constituents. There is no drainage or gas discharge involved in its production. Waste is utilized entirely.

This process has been adopted at the Crimea Titanium Dioxide Plant imeni 50th Anniversary of the USSR. The economic effect constituted 387 rubles per ton product.

It was developed by the Chelyabinsk Branch of the Scientific Research and Planning Institute of Inorganic Pigments and Ship Coatings and the "Pigment" SPA in Leningrad.

●Chromin ["khromin"] is a product used in electrochemical chrome-plating processes at any working temperature. The main ingredient is an organic surfactant with exceptional resistance to high anode potentials, concentrated acids and heating (as well as a combination of these factors). Chromin is superior to foreign products used for an analogous purpose in its effectiveness. Use of this agent in electrochemical chrome-plating has the following advantages: it rules out virtually entirely loss of chromium compounds in the air environment; sanitary working conditions are significantly improved and there is drastic reduction of corrosion of equipment, ventilating systems and air ducts in chrome-plating shops.

It was developed by the State Institute of Applied Chemistry.

●A process has been developed for decontaminating "tail" gases after the unit for recovery of elementary sulfur. It is intended for fine removal from tail gases of toxic gaseous substances and makes it possible to recover an additional amount of elementary sulfur as a result of return of nonreacting hydrogen sulfide to the thermal step of the unit for recovery of elementary sulfur.

The annual economic effect will constitute 100,000 rubles.

It was developed by the NIlogas [State Scientific Research Institute for Gas Purification in Industry and Sanitation], Giprogazoochistka [State Institute for the Planning of Gas-Purifying Installations] and VNIlgaz [All-Union Scientific Research Institute of Natural Gas].

●The Voronezh Branch of the All-Union Scientific Research Institute of Synthetic Rubber imeni S. V. Lebedev has developed and introduced a method of recovering a low molecular copolymer of butadiene with styrene SBS-N80, a film-forming material for the paint and varnish industry, which makes it possible to replace vegetable oil. The method is based on polymerization of butadiene with styrene in a xylene solution. Polymerization occurs at a high speed, with 100% conversion of monomers. There are no side reactions at all stages of the process, nor any waste gases and waste water.

With an output volume of 5000 tons/year, the economic effect will constitute 985,000 rubles.

#### Promising Mineral Fertilizers

●Nitroammophoska [complete fertilizer] + Mo (17% N, 17%  $P_2O_5$ , 17%  $K_2O$ , 0.05% Mo) is a concentrated fertilizer with molybdenum; it is used for all types of soil and all agricultural crops.

●Nitroammophoska + B (17% N, 17%  $P_2O_5$ , 17%  $K_2O$ , 0.17% B) is a concentrated fertilizer. It is recommended for vegetable, fruit-berry and flower plantings.

●Ammophos [ammonium phosphate fertilizer] + Zn (11% N, 52%  $P_2O_5$ , 1% Zn) is a concentrated fertilizer. It is used in all types of soil and agricultural crops.

●Potassium metaphosphate contains 100% phosphorus and potassium. It is a highly concentrated chlorine-free fertilizer. It is desirable for use for valuable crops that react adversely to potassium chlorites, such as tobacco, grapes, tea, etc.

#### Plant Growth Regulators

●Gibberellin is 75-90% white crystalline powder that dissolves well in alcohol but poorly in water. It is used in raising seedless varieties of grapes in order to increase the size of the grapes and bunches. It is used at the rate of 0.02-0.05 kg/ha (d.v.) [expansion unknown]

Net income with use of gibberellin is 1000 rubles/ha.

●Hydrel ["gidrel"] is a 40% aqueous solution. It is used in growing tomatoes to enhance coordination of fruit maturation and preparation for mechanized harvesting, as well as to augment the early harvest when there are repeated ones. Standard outlay is 0.8-2.0 kg/ha, depending on the method of tomato growing.

Net income with use of hydrel is 1100-1500 rubles/ha. The yield increment is 40-85 q/ha and tomatoes ripen 11-18 days earlier than usual.

●Kampoza M is a 50% aqueous solution. It is used on winter rye fields to prevent lodging. Standard rate of use is 1.5-2.5 kg/ha (d.v.).

Net income with use of kampoza is 30 to 100 rubles/ha.

●Synthetic pyrethroids are a new generation of insecticides. They are characterized by high efficacy, 100-1000 times more effective than the traditional organochlorine and organophosphorus insecticides, low norm of use (5-300 g/ha), low toxicity for warm-blooded animals and man (LD<sub>50</sub> constitutes an average of over 1000 mg/kg); it is readily biodegradable without production of environment-polluting metabolites and decomposition products.

A method has been developed for complete synthesis and technology created for production of the most promising general-purpose pyrethroid, permethrin. An original preparative form has also been developed. Permethrin is put out in the form of 50% emulsifying concentrate.

An experimental batch of domestic permethrin was produced for the first time in the USSR and its biological effect was tested on different pests of agricultural crops and forest stands, ectoparasites and household insects that are carriers of infectious diseases. According to the results of these tests, the Soviet product is as good in its action as the well-known imported product, Ambush. At the present time, experimental production of permethrin has been set up at the rate of 100-200 kg/year.

The expected absolute economic effect of using this agent in agriculture (to protect cotton plantings) will be about 20 million rubles.

It was developed by the Institute of Organic Chemistry imeni N. D. Zelinskiy and Institute of Chemistry, Bashkir Branch of the USSR Academy of Sciences.



●A waste-free technology has been developed for recovery of  $\alpha$ -lecithin from phosphatide concentrate, the waste from the butter and lard industry. The obtained  $\alpha$ -lecithin is almost one-third the cost of lecithin produced by traditional methods, and for this reason it can be used extensively in the control of plant diseases. Lecithin is entirely nonphytotoxic, it is an active fungicide for the control of powdery mildew. It has no cumulative properties, breaks down into harmless substances and has no effect at all on the atmosphere and soil. Use of  $\alpha$ -lecithin makes it possible to replace expensive imported agents with domestic fungicides that are absolutely harmless to man and the environment.

It has been introduced at the "Biokhimreaktiv" [biochemical reagents] SPA in Olayne. The annual economic effect is 1 million rubles.

The developer is the Dneprovskiy Institute of Chemical Technology imeni F. E. Dzerzhinskiy.\*

●The soil herbicide, simazin SNS is toxic for most types of weeds. The commercial simazin product contains 50-80% active agent (i.e., pure simazin). The product is resistant to water, air and soil solutions. The phytotoxic effect of simazin on weeds lasts 2 to 6 months, depending on weather conditions.

The developer is the Institute of Experimental Botany, Belorussian Academy of Sciences.

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\*Translator's note: Our records indicate that this is the Dnepropetrovsk (rather than Dneprovskiy) institute.



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CSO: 1841/57

## COAL GASIFICATION

UDC 662.741.3.022.001.5:622.333.03/(47 + 57)

### COMPARATIVE CHARACTERISTICS OF COKING COALS FROM NORTH-EASTERN REGIONS OF USSR

Moscow KOKS I KHIMIYA in Russian No 10, Oct 83 pp 4-7

KURBATOV, V. P., VUKHIN [Eastern Scientific Research Institute of Coal Chemistry]

[Abstract] The principal suppliers of coking coal in north-eastern regions of the USSR are the Kuznetsk, Karaganda, Pechorsk and Kizelovsk basins; the Yuzhno-Yakutsk and Bureinsk basins are considered as potential resources. Each of these coals should exhibit an optimal density level of separation, which in this study was identified as maximum level of ash content. Analysis of the experimental data showed that the most valuable indices were observed in coals from the Pechorsk basin followed by material from the Kuznetsk, Yuzhno-Yakutsk, Karaganda, Kizelovsk and Bureinsk basins. Even though the results obtained are not ideal, they do represent adequately comparable technological qualities of coking coals from single or multiple basins. These characteristics could be used in evaluating various coal deposits, theoretical and pragmatic reserves available and in long range planning of the utilization, search for and production or enrichment of coal deposits. Figures 2; references 12 (Russian).  
[53-7813]

UDC 662.741.3.022.001.5

### EVALUATION OF GAS-DYNAMIC PROPERTIES OF LUMP COAL USED FOR PREPARATION OF NON-BLAST FURNACE COKE IN SHAFT FURNACES

Moscow KOKS I KHIMIYA in Russian No 10, Oct 83 pp 7-11

YENIK, G. I., OL'FERT, A. I., OMEL'CHENKO, L. M. and TITOV, I. P., IGI [Institute of Mineral Fuels]

[Abstract] Comparative evaluation of coal and coke during a process of sequential exposure to destructive discarding identified similarities and

differences in the behavior of these materials. Relative mass decrease of the secondary pieces (bigger than 40 mm) was more intensive in coal specimens than in the coke; among smaller lumps (40-25 mm) this difference disappeared. The difference in the shapes of coal and coke was demonstrated by more intensive increase in the coefficient of non-tetragonality of coal pieces expressed as a function of destructive pressures resulting from anisotropic breakdown along the layering planes and increased isotropic texture of coal pieces. Mechanical equivalent of thermal and mechanical effects on coal resulting from the coking process equals about 5 revolutions of the production drum in the drying zone or about 25 for the entire oven, including the zones of coking and cooling. The complex index of gas penetration of the coal from Angarsk plant, which included the considerations of the strength properties and the changes in granulometric composition during the coking process, amounts to about 155-175 units. Figures 2; references 6 (Russian). [53-7813]

UDC 662.749.074.39

#### USE OF HYDROGEN CYANIDE OF SULFUR-PURIFICATION-SHOP REGENERATOR GAS FOR AMMONIUM THIOCYANATE PRODUCTION

Moscow KOKS I KHIMIYA in Russian No 11, Nov 83 pp 29-30

SMOL'YAKOV, N. K., Yasinovskiy Coking By-product Plant

[Abstract] A procedure used to collect hydrogen cyanide from the sulfur purification shop regenerator gas by an ammonium polysulfide solution, developed at the Yasinovskiy coking by-product plant, was described and discussed. Ammonium polysulfide is initially produced by contact of  $H_2S$  and ammonia--to form ammonium sulfide, which is then reacted with sulfur to form the polysulfide. Removal of hydrogen cyanide from the regenerator gas is achieved by direct contact of the regenerator gas and the ammonium polysulfide solution. This process yields important raw materials, e.g., ammonium thiocyanate, and serves to protect the environment. The degrees of extraction of HCN reaches 90 to 98 percent. A schematic diagram of the procedure is presented and discussed. Figure 1. [72-2791]

## MAGNETIC APPARATUS FOR BY-PRODUCT COKE INDUSTRY

Moscow KOKS I KHIMIYA in Russian No 11, Nov 83 pp 42-45

GLUSHCHENKO, I. M. and GISHAYENKO, S. P., Dneprodzerzhinsk Industrial Institute and MYAKOV, Yu. V., Moscow Tekhnikum of Electronic Devices

[Abstract] Experience in designing and using magnetic devices in the coking by-product coke industry is discussed. Criteria to be considered in designing magnetic apparatus are presented and basic design and magnetic parameters of such devices are listed. The AFEM-300 magnetic apparatus satisfies these requirements; it is also possible to inspect the running clearances and it is possible to clean them without dismantling the device itself. A diagram of the device is presented; its construction and method of operation are described. The devices are being introduced at Dneprodzerzhinsk coking By-Product Coke Plant and Dneprovskiy Metallurgical Plant. The apparatus provides a significant economic and technical effect at relatively low cost due to improvement of technological processes. Figure 1; references 6 (Russian), [72-2791]

UDC 662.74.013.8:662.784.074.371

## CHEMISTRY OF REMOVAL OF HYDROGEN CYANIDE FROM COKE-OVEN GAS WITH PRODUCTION OF ETHYLENETHIOUREA

Moscow KOKS I KHIMIYA in Russian No 11, Nov 83 pp 25-29

MARAKHOVSKIY, L. F. and BRODOVICH, A. I., Scientific Research Institute of Coal Chemistry; PROYCHEVA, A. G. and SHMYREVA, N. N., Scientific Research Institute of the Rubber Industry

[Abstract] Results of laboratory and pilot studies of removal of hydrogen cyanide from coke-oven gas are presented and reprocessing of the used absorption solution is discussed. The authors used a method which had been worked out at the Scientific Research Institute of Coal Chemistry; that method, the EDA (ethylenediamino) process of deep purification of coke-gas of acid components, is a circular process. A solution of EDA sulfide, plus finely-divided sulfur, produces, in the reactor, polysulfide sulfur (PSS). Further, PSS is formed in EDA solution (without addition of sulfur) by oxidation of present  $H_2S$  to yield S and water; the intermediate product of  $H_2S$  reaction with EDA combines with the S to form the PSS. In the presence of cyanide ion, PSS reacts with it to form rhodamine. Rhodamine EDA can be extracted in pure form from the mixture. The EDA salt is unstable and, when heated, is converted to ethylene thiourea, of considerable value to the national economy. Thus, removal of the pollutant HCN from coke gas protects the environment and simultaneously acquires an important raw material. The purification reactor unit design is presented. Figures 6; references 6 (Russian), [72-2791]

## EFFECT OF MINERAL PORTION OF DICTYONEMA SHALE ON YIELD AND COMPOSITION OF ITS THERMAL DECOMPOSITION PRODUCTS

Tallinn IZVESTIYA AKADEMII NAUK ESTONSKOY SSR in Russian Vol 32, No 4,  
Oct-Nov-Dec 83 (manuscript received 3 Nov 82) pp 246-251

VYSOTSKAYA, V. and UROV, K., Institute of Chemistry, ESSR Academy of Sciences

[Abstract] The role of mineral substances in shales is especially important in high-ash oil shales used in petrochemistry. Enrichment with kerogen has been shown to have little affect on yield and composition of products from Kashpir shale; in the present study the authors report on tests of ore from the Toolse deposit, with primarily aluminosilicate mineral content. Thermal decomposition of kerogen was measured with organic mass varying from 56.1 to 13.0%. Resins produced by dephenolization with a 10% sodium hydroxide aqueous solution were separated using thin-layer chromatography on silica gel with an *n*-hexane elutriator, and semicoking gas was analyzed chromatographically using separon and CaA molecular screens. Resin yield and initial organic mass content were found to be directly related. The Toolse shale had mostly non-aromatic hydrocarbons, while maximum resin-yield corresponded to content of neutral heteroatomic compounds and was also related to minimum CO<sub>2</sub> yield. Changes in the hydrocarbon composition of resins with decreasing organic content indicates intensive secondary destructive processes. The role of mineral components in the shale was more complex, and requires further study. Figures 3; references 10: 6 Russian, 4 Western.  
[65-12131]

## NITRIC ACID OXIDATION OF ACTIVATED CONCENTRATES OF ORGANIC MATTER OF KUKERSITE OIL SHALE

Tallinn IZVESTIYA AKADEMII NAUK ESTONSKOY SSR in Russian Vol 32, No 4,  
Oct-Nov-Dec 83 (manuscript received 13 Apr 82) pp 252-258

VESKI, R., METSIK, Leyda and SEPP, E., Institute of Chemistry, Estonian SSR Academy of Sciences; "Dezintegrator" Special Technical Design Bureau

[Abstract] The round and centrifugal-reflector mills used to pulverize oil shale in producing kerogen-70 and kerogen-90 are crucial to the process, but specific features of their effects have not been studied. The authors here present data on final pulverization of a flotation concentrate of kukersite as it affects its oxidation by nitric acid. The "Dezintegrator" design bureau developed rotor and beater pulverizers for the project. Results indicated that organic mass concentrates of kukersite varied, depending, on the manner of pulverization in mean surface and content of

mineral and organic matter, as well as in element composition of the organic matter. Average volume was in nearly a linear relationship to the number of rotor revolutions, and the finger beater rotor achieved somewhat greater pulverization than the blade rotors. Concentrate oxidation showed that a 30% nitric acid solution started to increase solubility in alkali, while 70%  $\text{HNO}_3$  brought nearly complete solubility. The dissolved and precipitated products of kerogen destruction were polyfunctional acids that precipitated more thoroughly as percentage yield per unit of concentrate dissolved in alkali increased. Figures 4; references 20: 18 Russian, 2 Western.  
[65-12131]

UDC 541.127.3;541.124.7

HYDROGEN OXIDATION NEAR FIRST THRESHOLD OF IGNITION IN METAL REACTORS

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 57, No 10, Oct 83  
(manuscript received 18 May 82) pp 2444-2447

ALEKSANDROV, Ye. N., ARUTYUNOV, V. S., DUBROVINA, I. V. and KOZLOV, S. N.,  
Institute of Chemical Physics, USSR Academy of Sciences, Moscow

[Abstract] Reaction of lean and stoichiometric mixtures in metal reactors was studied and the possibility of disturbing the stoichiometric ratio was checked. Three series of experiments on ignition of a detonating mixture were performed: a  $2\text{H}_2 + \text{O}_2$  mixture in a stainless steel reactor a  $2\text{H}_2 + \text{O}_2$  mixture in a gold-covered reactor and a 6.4 $\text{H}_2 + 93.6$  percent  $\text{O}_2$  mixture in a gold-covered reactor. It was found that the main error made during calculation of depletions based on change of pressure is associated with the cold space (water vapors are scarcely absorbed by the walls of the steel vessel). Experiments involving simultaneous recording of pressure and measurement of concentration of H atoms showed that the rate of  $\text{O}_2$  expenditure equals approximately  $C \times (\text{H})(\text{O}_2)$ . (This supports conclusions of Vedeneyev, et al., 1981.) Study of the possibility of absorption of atomic H by walls of a gold vessel showed a negligibly small percent of atoms irreversibly escaping from inside under the experimental conditions. The nearly total depletion of the stoichiometric mixture in the stainless steel vessels means that there is no serious disturbance of stoichiometry. Figures 2; references 20: 19 Russian, 1 Western.  
[71-2791]

OXIDATION OF HYDROGEN NEAR FIRST THRESHOLD OF IGNITION IN KINETIC REGION OF  
BREAKING OF CHAINS

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 57, No 10, Oct 83  
(manuscript received 18 May 82) pp 2448-2453

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[Abstract] Experiments involving deeper cleansing of the reactor than was done in former experiments and the use of resonance-fluorescence recording of active centers of reaction were performed in an attempt to explain the cause of anomalously high depletions of  $2H_2+O_2$  in the kinetic region of quartz reactors washed by boric acid. It was found that the basic cause of high depletion was inhibition of the reaction by products of interaction of the active centers of reaction with the vacuum lubricant. Anomalously high depletion was absent in experiments using a "lubricant-free" reactor. A schematic diagram of the experimental device is presented. Figures 5; references 9 (Russian).  
[71-2791]



## ELECTROCHEMISTRY

UDC 541.138

### ROLE OF WATER IN METHANOL CHEMOSORPTION AND DEHYDROGENATION PROCESSES OVER PLATINUM

Moscow ELEKTROKHIMIYA in Russian Vol 19, No 10, Oct 83  
(manuscript received 24 Jun 82) pp 1393-1397

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[Abstract] The goal of this project was to study the mechanism of methanol chemisorption over platinum in absolute methanol solutions and to investigate the role of water in the chemisorption and dehydrogenation processes. The experimental results obtained indicated that methanol chemisorption with dehydrogenation over platinum occurs to a lesser degree in absolute methanol system than in aqueous solutions. Indeed it could be possible that no chemisorption occurred at all, and whatever did happen was due to traces of water, which was impossible to remove entirely from the electrode surface. This shows that water plays a decisive role in these processes. As a rule, in absolute methanol solution, a weak adsorption of methanol molecules was observed on the surface of platinum electrode with no significant destruction or dehydrogenation. Figures 3; references 11: 6 Russian, 5 Western (1 by Russian authors).

[56-7813]

UDC 541.138.3

### BREAKDOWN OF PLATINUM ELECTRODE COATING DURING CATHODE POLARIZATION IN SEA WATER

Moscow ELEKTROKHIMIYA in Russian Vol 19, No 10, Oct 83  
(manuscript received 29 Dec 81) pp 1418-1420

MIKHAYLOVA, L. A., KHODKEVICH, S. D., BOGATSKAYA, T. G. and  
YAKIMENKO, L. M., Moscow

[Abstract] Study was made of the effect of alkaline and alkaline-earth metal ions, contained in sea water, on the rate of breakdown of cathode

platinum and platinum-plated titanium electrodes using a radiochemical method. Under experimental conditions of slow electrolyte flow and a pH of 9-9.5, the accelerated breakdown of platinum cover of the cathodes during electrolysis of sea water was due to the presence of  $\text{Ca}^{++}$  and  $\text{Mg}^{++}$  ions. The  $\text{Mg}^{++}$  ion effect was weaker than the  $\text{Ca}^{++}$  ion effect. This phenomenon was manifested markedly during reverse current processes. Figures 3; references 9 (Russian).  
[56-7813]

UDC 541.138.3:621.357.3

#### ELECTROSYNTHESIS OF ORGANIC COMPOUNDS USING SOLID POLYMER ELECTROLYTE

Moscow ELEKTROKHIMIYA in Russian Vol 19, No 10, Oct 83  
(manuscript received 23 Mar 83) p 1447

GRINBERG, V. A., ZHURAVLEVA, V. N., VASIL'YEV, Yu. B. and  
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Moscow

[Abstract] A series of electrocatalytic synthetic reactions was achieved on a cathode in aqueous and non-aqueous solutions using a membrane-electrode block. In this fashion, reduction of  $\text{CO}_2$  in water over a tin cathode led to the formation of formic acid, and, in anhydrous acetonitrile over a stainless steel cathode - to oxalic acid. The principal product of cathode reduction of acetone over a lead electrode in water was isopropanol. Reduction of acrylonitrile over lead in a mixture of water-acetonitrile yielded propionitrile and adipodinitrile, while introduction of tetrabutylammonium acetate to the reaction solution favored formation of adiponitrile. References 3: 1 Russian, 2 Western.  
[56-7813]

## FERTILIZER

UPDATE ON CONSTRUCTION OF CARBAMIDE PLANT IN NEVINNOMYSSK (STAVROPOL KRAY)

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 28 Oct 83 p 1

[Article by L. Aleynik, correspondent at the press center of the USSR Ministry of Installation and Special Construction Work: "Contract Reserves"]

[Text] Installation of technological equipment has been finished at the Nevinnomyssk "Azot" [nitrogen] Association, and a major complex designed to produce 330,00 tons of complex mineral fertilizers per year is close to starting up operations.

The builders, installers and operators in Stavropol Kray have taken on the obligation of delivering the first products by the 66th anniversary of the Great October Revolution.

The granulation tower is the technological and architectural center of the new complex. This huge edifice, the height of a 50-story building, was erected by the brigade of installers and high riggers [iron workers] of L. Chapa from the "Spetszhelezobetonstroy" [Special Reinforced Concrete Construction Trust] of the USSR Ministry of Installation and Special Construction Work in only 4 months, instead of the standard 7 months. The brigade contract, which has become a very wide practice at the construction site, served as impetus for accelerating construction. This was also aided by the prompt delivery of the proper materials and equipment to outfit the projects, as well as the socialist competition based on the "worker relay" principle. The workers of the concrete plant of the general contractor trust, Stavropolkhimstroy [Stavropol Chemical Construction Trust], of the USSR Ministry of Industrial Construction, which manufactured the fittings and foundation parts ["zakladnyye detali"], together with the high riggers, took on the key duties in this project.

The pace set by the high riggers was followed by the specialists of Stavropoltekhmontazh [Stavropol Technical Installation Trust?]. They were responsible for assembly of all eight inside spans, that were stuffed with equipment and pipes. They prepared for the work thoroughly. They assembled in good time a unique, 154-meter tall crane. They prepared detailed work schedules that were coordinated with the subcontractors. Equipment and large units were assembled at the installation base of the Nevinnomyssk Administration of the trust.

"The good preparations," said Yu. Koval'chuk, administrator of the Stavropol'tekhmontazh Trust, "provided us with a certain 'margin of safety,' and then secured success, having organized work on three shifts to install the spans. As in the case of the subcontractors from Spetszhelezbetonstroy, the contract taken on by the brigade of Ye. Grigor'yev helped accelerate the work. They finished before the due date that low-pressure pump house. The same principle was followed: they started to assemble and connect equipment when the construction workers were still erecting the shell of the building, then the brigade of our veteran, A. Dedyun, which had concluded a subcontractual agreement, installed the pump house in only 25 days, instead of the scheduled 3 months."

Next to the granulation tower and almost as tall as it is, is a steel synthesis stack, erected by brigades of the Yuzhstal'konstruktsiya [Southern Steel Construction] Trust. There, they are actively preparing for putting out the first product, they are running and testing the equipment.

Inside the stack a 209-ton reactor was installed, which is one of the most important technological units in carbamide production. Like the three others that are located here, there is a heavy-weight apparatus that was installed to the designed height by the installation workers of the brigade of V. Derevyanko from Stavropol'tekhmontazh, which is famous in Northern Caucasus, and he is the recognized expert in hoisting the most complicated and largest apparatus.

The specialists of Giprotekhnmontazh [State Institute for the Planning of Technical Installations] have developed for such hoisting an original new method; they decided to make use of the carrying capacity of the components of the synthesis stack. This made it unnecessary to assemble and install special installation poles, which yields a considerable saving of time and effort.

Extensive creative search for ways and means of speeding up the work has become a typical feature at this construction site. The party headquarters of the All-Union key (project) is to be largely credited for this. The headquarters concerned themselves about seeing that the most responsible sectors of work were headed by communists, people whose professional skill and civic maturity had undergone good testing in erection of the most important installations of the national economy. The headquarters organized and checked on a daily basis the progress of the competition following the "worker relay" principle.

The general fighting spirit inspired every brigade to search for more and more new reserves to increase labor productivity and shorten construction time.

This is a fervent and important period for all teams working on the carbamide complex. Work is being completed on many lines of the new plant. All 50,000 welded seams have been inspected. The principal technological equipment has already been run in operating modes, and chemical constituents for carbamide synthesis have been delivered into the units. The plant operators are toiling everywhere, together with the specialists in start-up and adjustment work, getting acquainted with their work places.

On the eve of the 66th anniversary of the Great October Revolution, the first granules will be produced here, and by the end of the year, carbamide production will be in full swing in Nevinnomysk.

10,657  
CSO: 1841/46

## ONE MORE COMPLEX FOR CARBAMIDE PRODUCTION BEING READIED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 1 Nov 83 p 1

[Article by N. Styazhkin (TASS correspondent), Nevinnomyssk, Stavropol Kray]

[Text] The farmers know that every grain of carbamide introduced into the land means an additional harvest. Pre-startup testing has begun on the automated technological complex that will deliver 330,000 tons of mineral fertilizers per year to kolkhozes and sovkhozes, at the "Nitrogen" Association in Nevinnomyssk.

V. Prokhorov, general director of the association, stated: "According to the obligations assumed by construction and installation workers, it was planned to have the complex ready on the eve of the anniversary of the Great October Revolution. But the installation work was finished ahead of schedule."

At the start of the current Five-Year Plan, there was only an empty steppe covered with feather grass where we now see the 155-meter granulation tower. Hundreds of items of equipment were delivered only last summer from the producing plants to the construction site.

"It was installed right from the railroad platform," interjected V. Derevyanko, leader of the brigade of the installation trust, Stavropol'tekhmontazh [Stavropol Technical Installations]:

A heavy reactor, weighing 210 tons and the height of a 10-story building, is the "heart" of the technological complex. It was manufactured in fraternal Czechoslovakia and delivered to Nevinnomyssk in assembled form, ready to operate. The brigade of V. Derevyanko has had experience in working with such giants. The installers have already set up there, in operating position, a column for ammonia synthesis weighing 470 tons. This time, the dimensions of the unit were smaller, but considerable difficulties arose.

"Two special cranes of a special design were needed. To move them from other construction sites is a long and expensive job," continued the brigade leader.

The installers managed to hoist the reactor without cranes, having used, for the first time in their career, synchronously controlled winches. The advantages were evident right away: they saved almost 2 weeks of work time and over 25,000 rubles.

The Nevinnomyssk chemical specialists had delivered carbamide to farmers before. The new complex is considerably larger than the existing one, which has been

functioning for almost 20 years. However, one-third less operators and repairmen will service it. This is the effect of introducing electronics.

The granulation tower of the new facility is almost three times taller than the existing one, and this is not by chance. Dropping from a greater height, the droplets of synthesized carbamide harden better, sticking is ruled out when they are stored and transported to the fields.

"The nation's food program provides for a considerable increase in harvest of sturdy and valuable varieties of grain. Carbamide is a good helper for the farmers in raising spikes of a higher quality," states the association's general director, concluding the conversation.

The supplement of nitrogen fertilizers for the crops has made it possible to double the yield of such grain in recent years in Stavropol Kray alone.

By the time of the holiday of the Great October Revolution, the first commercial batches of granulated carbamide will be shipped to the farmers from the complex in Nevinnomyssk.

10,657  
CSO: 1841/49

CARBAMIDE PRODUCTION TO FOLLOW AMMONIA PRODUCTION

Moscow STROITEL'NAYA GAZETA in Russian 7 Oct 83 p 2

[Article by A. Prigodich: "After Ammonia--Carbamide"]

[Text] The mineral fertilizer plant of the Angarsknefteorgsintez [Angarsk Petroleum and Organic Synthesis] Association is gaining strength.

Recently, a large complex was started up here for the production of ammonia water and liquefied ammonia. For the first time in Soviet practice, the people of Angarsk will recover it from petroleum, from the products of petroleum distillation.

At the present time, the participants in the "Labor Competition," at the department of the Angarsk Administration for Construction and specialized subcontractor organizations are erecting at high speed the second complex of the association with capabilities to produce carbamide.

10,657  
CSO: 1841/46



COMPLEX FORMATION BY ORGANOBORON COMPOUNDS, PART 23: COMPLEXING OF  
TRIARYLBORONS WITH 4-AMINO-1,2,4-TRIAZOLE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 53, No 10, Oct 83  
(manuscript received 20 Sep 82) pp 2332-2334

YUZHAKOVA, G. A., BELONOVICH, M. I., RYBAKOVA, M. N., MOROZOVA, T. L.  
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[Abstract] 4-Amino-1,2,4-triazole (I) was employed as a ligand in complex formation with triarylboron compounds (Ar = phenyl, p-tolyl, 2,5-xylyl, 1-naphthyl, p-methoxyphenyl, o-methoxyphenyl, p-ethoxyphenyl, p-chlorophenyl). The resulting complexes were colorless or slightly yellow crystals soluble in acetone and chloroform, soluble in ethanol on heating, and insoluble in water and other polar solvents. Under a variety of experimental conditions only 1:1 complexes were formed, i.e., I behaved as a monodentate ligand due to the fact that nitrogen atoms 1 and 2 have a high  $\pi$ -electron density and serve as electron donors. Tabular data on IR spectra of the complexes are included. References 7 (Russian).  
[68-12172]

ORGANOPHOSPHORUS COMPOUNDS

UDC 546.183+547.26'118

NOVEL TYPE OF PHOSPHORUS-CONTAINING BETAINES: INTERNAL SALTS OF ACID-SUBSTITUTED AMINOVINYL PHOSPHATES

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 272, No 6, Oct 83  
(manuscript received 28 Feb 83) pp 1388-1391

GOLOBOV, Yu. G., KIM, T. V. and KISELEVA, Ye. I., Institute of Organic Chemistry, Ukrainian SSR Academy of Sciences, Kiev

[Abstract] Phosphorus-containing betaines have not been previously described; they are derivatives of alpha-unsaturated esters of phosphoric acid and may be of practical interest since many betaines based on aminoalkyl esters of phosphoric acid have medicinal use. A description is provided of the synthetic steps leading to the formation of O-phosphorylated derivatives of aminoaldehydes and aminoketones, which rely on the transformation of O-phosphorylated allyl chlorides into O-phosphorylated allyl amines by replacement of the allyl halide by an amino group from a secondary amine and dealkylation of the acid chlorides to betaine. Physical data on seven such phosphorus-containing betaines are summarized in tabular form, the structures of which were confirmed by IR, EPR, and NMR spectroscopies. References 5: 4 Russian, 1 Western.  
[58-12172]

UDC 661.183;615.47

HETEROGENEOUS CATALYSIS DURING ADSORPTION OF ORGANOPHOSPHORIC COMPOUNDS ON CARBON SORBENTS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 272, No 4, Oct 83  
(manuscript received 14 Feb 83) pp 902-905

MIKHAYLOV, S. S., SHCHERBAK, I. G., KUZNETSOV, M. S., LOSKUTOV, A. I., ABDUVAKHABOV, A. A. and SADYKOV, A. S., academician, 1st Leningrad Medical Institute imeni Academician I. P. Pavlov

[Abstract] An explanation of the mechanism of heterogeneous catalysis seen during adsorption of GD-7 preparation on sulfur-containing, activated carbon

GSB involved study of the kinetics of adsorption of GD-7 by GSB and, also, of as specially-synthesized homolog of GD-7, GA-96. Dynamics of change of anti-cholinesterase activity of GD-7 and GA-96 solutions upon adsorption on GSB was studied under static conditions. Adsorption of GD-7 on GSB led, first, to reduction of anti-cholinesterase activity of the solution and then, at the beginning of the second hour of vibration, the anti-cholinesterase action of the solution of this substance grew progressively. During adsorption of Ga-96 on sorbent GSB, anti-cholinesterase activity of a solution of this inhibitor gradually decreased until adsorption equilibrium was reached, indicating absence of heterogeneous catalysis. These findings were confirmed by thin layer chromatography of initial solutions of GD-7 and GA-96 and solutions of them after 10 hours of contact with GSB carbon. These data also indicated that adsorption of GD-7 preparation on the GSB is accompanied by heterogeneous catalysis of the transalkylation reaction. It is concluded that sulfur-containing activated carbon GSB should not be used as a hemisorbent to eliminate, from the blood stream, those organophosphoric insecticides which contain sulfidic sulfur in the molecule. Figures 2; references 10: 6 Russian, 4 Western.  
[32-2791]

UDC 547.752'26.118.07

#### SYNTHESIS OF PHOSPHORYLATED INDOLES USING m-AMINOPHENYL PHOSPHONATE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 53, No 10, Oct 83  
(manuscript received 14 Feb 83) pp 2394-2395

GUREVICH, P. A., STEPANOV, P. A. and RAZUMOV, A. I., Kazan Institute of Chemical Technology imeni S. M. Kirov

[Abstract] Details are provided on the synthesis of ethyl  $\alpha$ -ketobutyrate m-phosphonatoylphenylhydrazone (I) by the reaction of ethyl acetoacetate with m-diazophenylphosphonium in alcohol. Cyclization of I by boiling in glacial acetic acid for 3 h resulted in the formation of 2-ethoxycarbonyl-3-methyl-6-phosphonatoylindole. IR and NMR spectroscopic data confirmed the formation of the latter product. References 3: 1 Russian, 2 Western.  
[68-12172]

## SYNTHESIS OF 6-INDOLYLPHOSPHONATES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 53, No 10, Oct 83  
(manuscript received 14 Feb 83) pp 2395-2396

GUREVICH, P. A., STEPANOV, P. A., ZYKOVA, T. V. and RAZUMOV, A. I.,  
Kazan Institute of Chemical Technology imeni S. M. Kirov

[Abstract] Description is provided of the synthetic steps in the formation of indoles with phosphoryl substituents on the benzene ring. The selected approach involved reaction of 5,6-dinitroindoline with triisopropyl phosphite (1:5 ratio) in absolute acetonitrile with boiling for 8 h to give crystalline 5-nitro-6-(O,O-diisopropylphosphonatoyl)indoline (I). Dehydrogenation of I with manganese dioxide in absolute methylene chloride at 20°C for 30 h resulted in the formation of 5-nitro-6-(O,O-diisopropylphosphonatoyl)indole. References 4: 2 Russian, 2 Western.  
[68-12172]

UDC 546.185.131+547.26.118

## REACTION OF PHOSPHORYLATED ALCOHOLS AND ACETALS WITH PHOSPHORUS PENTOXIDE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 53, No 10, Oct 83  
(manuscript received 3 Jan 83) p 2397

GAZIZOV, M. B., KHAYRULLIN, R. A., ZAKHAROV, V. M., MOSKVA, V. V. and  
SAVEL'YEVA, E. I., Kazan Institute of Chemical Technology imeni S. M. Kirov

[Abstract] Benzene solutions of phosphorylated alcohols and acetals were used for reaction with  $\text{PCl}_5$  (1:1.2 ratio) at 10-20°C to form  $\alpha$ -phosphorylated alkylidichlorophosphates (I). The reaction mechanism presumably involved formation of an intermediate quasiphosphonium cation which subsequently underwent intramolecular cyclization to give I. NMR spectral data confirmed the formation of I. References 3: 2 Russian, 1 Western.  
[68-12172]

## REACTION OF DIALKYL PHOSPHITES WITH o-NAPHTHOQUINONE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 53, No 10, Oct 83  
(manuscript received 21 Mar 83) pp 2398-2399

KUTYREV, A. A. and MOSKVA, V. V., Kazan Institute of Chemical Technology  
imeni S. M. Kirov

[Abstract] Dialkyltrimethylsilyl phosphites were reacted with o-naphthoquinone to synthesize 1-trimethylsiloxy-2-O-(0,0-dimethylphosphoryl)naphthalene and 1-trimethylsiloxy-2-O-(0,0-diethylphosphoryl)naphthalene. The latter were hydrolyzed by boiling in an excess of methanol or ethanol to obtain, respectively, 1-hydroxy-2-O-(0,0-dimethylphosphoryl)naphthalene and 1-hydroxy-2-O-(0,0-diethylphosphoryl)naphthalene. IR and NMR spectral data are provided for all four compounds. References 1 (Western).  
[68-12172]

## AROMATIC NITROSO COMPOUNDS IN KABACHNIK-FIELDS REACTION

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 53, No 10, Oct 83  
(manuscript received 21 Mar 83) pp 2401-2402

MATEVOSYAN, G. L., ZHURAVLEV, A. V. and ZAVLIN, P. M., Leningrad  
Agricultural Institute

[Abstract] The Kabachnik-Fields reaction [Kabachnik, M. I. and Medved', T. Ya., DAN SSSR, 83:689, 1952; Fields E. K., J. Am. Chem. Soc., 74:1528, 1952] was carried out to synthesize heterocyclic hydrazides of phosphoric acid by reacting p-nitrosodimethylaniline and diethyl phosphite with imidazole or benzimidazole to give O,O-diethyl-N-1-imidazolyl-p-dimethylaminophenylamidophosphate (I) and O,O-diethyl-N-1-benzimidazolyl-p-dimethylaminophenylamidophosphate (II). By substitution reactions I and II were converted to O,O-diethyl-N-1-imidazolyl-p-diethoxyphosphonylphenylamino-phosphate and O,O-diethyl-N-1-benzimidazolyl-p-diethoxyphosphonylphenylamidophosphate. The structure of each compound was confirmed by IR and NMR spectroscopy. References 2: 1 Russian, 1 Western.  
[68-12172]

## PETROLEUM PROCESSING TECHNOLOGY

### EXCESSIVE LABORATORY EQUIPMENT PURCHASING CRITICIZED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 29 Oct 83 p 2

[Article: "On a Merchant Scale"]

[Text] Representatives of the scientific production Lenneftekhim [Leningrad Petrochemical] Association were purchasing expensive laboratory equipment on a truly large scale. While purchases over the entire period of the last Five-Year Plan totaled 3,780,000 rubles, they have already constituted 6.3 millions for the first half of the current Five-Year Plan. Ten times more imports were purchased now than in the entire period of the 10th Five-Year Plan.

The expectation was to augment the yield from research, but in actuality the opposite occurred. There was a drastic reduction in economic effect per ruble spent. And how could it do otherwise, when one-third of all the purchases was accumulated in a single laboratory dealing with the study of rust. Almost 3 million rubles' worth of complicated and, in some cases, unique, electronic equipment is standing there as dead weight: it turned out that there were no specialists in the laboratory capable of handling it. For example, since April of 1979 there is an electron microscope standing there that costs 160,000 rubles; for 1.5 years a photoelectronic spectrometer costing 586,000 rubles and heat analyzer worth 175,000 are collecting dust. They do not even know how to turn some of the equipment on, because no one bothered to translate operating instructions into Russian. No wonder that some of the instruments turned out to be disassembled.

As shown by an inspection, conducted by the Leningrad State Committee of National Control, the secret of such generosity was simple. Yu. Archakov, deputy director for science is in charge of equipment purchasing in the association, and he is expressly the one who is the chief of this laboratory.

The national inspectors wanted to impose an exemplary punishment on this thrifty administrator, but they discovered that very recently they had already imposed a strict punishment on him for the low level of computer use at the institute. For this reason, the reprimand was addressed this time to the general director of the association, G. Lastovkin. It was also decided to suggest to the USSR Academy of Sciences that it examine the possibility of using the unique analytical instruments that are standing idle in other scientific research organizations of Leningrad.

10,657

CSO: 1841/46

UDC 665.644.004.1

USE OF CATALYTIC CRACKING APPARATUS AT NOVO-YAROSLAVSKIY PETROLEUM  
PROCESSING PLANT

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 10, Oct 83  
pp 7-8

ZAYASHNIKOV, Ye. N., "Yaroslavnefteorgsintez" Production Association

[Abstract] The 1A/1M cracking plant of the Novo-Yaroslavskiy Petroleum Processing Plant, installed in 1967, has suffered from irregular operation, high catalyst consumption and low productivity. The present study reports on efforts to improve these parameters since 1974, with collaboration between the All-Union Scientific Research Institute for Petroleum Production and other organizations. Other shortcomings at the plant have included insufficient cooling surface and high levels of impurities from the catalyst in heavy gas oil. A new air distributor has been added to improve the boiling layer, and a new reboiler was supplied. These alterations improved operations significantly. A lined delivery system and air refrigeration to replace water coolers were also installed, along with centrifugal pumps. Gasoline production was increased to 39% of input. Another significant series of improvements were made to the regeneration system, resulting in reduced residual coke content and further increases in gasoline production. Future planned improvements will include redesigned electrical filters and other modifications to give higher production and longer time between major overhauls.

[44-12131]

## IMPLEMENTING NEW CATALYST REGENERATION TECHNOLOGY AT 1A/1M UNIT

Moscow KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL in Russian No 10, Oct 83  
pp 8-10

STANKEVICH, V. A., MARKHEVKA, V. I., ZHITOMIRSKIY, B. M.,  
MELIK-AKHNAZAROV, T. Kh., SHLYAKHOVSKIY, I. D., MEL'MAN, A. Z. and  
ZAYASHNIKOV, Ye. N., All-Union Scientific Research Institute for Petroleum  
Production; "Yaroslavnefteorgsintez" Production Association

[Abstract] The authors report on improved technology required for introduction of zeolite-containing catalysts at the 1A/1M installation. The core of the regenerator at the Novo-Yaroslavskiy plant was sectioned and a vertical cylindrical section added, and a staged-counterflow regeneration process instituted, thus providing significant temperature gradation advantages. During a major overhaul in 1983, the apparatus was redesigned to include a gas distribution system and an overflow device. Along with improvements in operation, small fraction content was reduced limiting the circulation rate of the catalyst. CO could be burned off without danger of explosion, thus permitting a temperature increase in the lower zone to 620-630°C. Reduction of residual coke on the catalyst and the temperature increase allowed for 4-5% higher gasoline yield, along with other technical and economic advances. References 2 (Russian).  
[44-12131]

UDC 665.644.2:[665.635:665.642.4]

## OPERATION OF 1A/1M APPARATUS WITH A TWO-STAGE PROCEDURE

Moscow KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL in Russian No 10, Oct 83 pp 10-12

PRYANIKOV, Ye. I., GUSEYNOV, A. M., MKRTYCHEV, A. A., RUSTAMOV, M. I. and  
TARANETS, E. A., Institute of Petroleum Chemical Processing AzSSR Academy  
of Sciences; Novo-Baku Petroleum Processing Plant imeni Vladimir Il'ich

[Abstract] The present study completes reports on introduction of a two-stage catalytic cracking process at the 1A/1M-type reactor of the Novo-Baku plant, after work was completed and a sufficient operational record established. The crude oil processed consisted of 15-35% low temperature fractions (to 350°C), 65-70% paraffin-naphthene and 27-32% aromatic hydrocarbons. A mixture of microspherical zeolite-containing and amorphous catalysts was employed. The first stage of the apparatus had a rising penetrating catalyst flow for fresh crude, while the reflex passed through a reactor with a semi-continuous catalyst flow. Results showed that the greatest gasoline yield from the first reactor came at 500-515°C, while the second-stage reactor was most productive at 470-490°C. The input feed rate had a distinct impact on



gasoline yield at 470-480°C, but that effect decreased at 500-515°C. Further operational improvements require consistent temperature and crude oil quality control. Figures 2; references 3 (Russian).  
[44-12131]

UDC 665.644.004.1

#### OPERATION OF 1A/1M APPARATUS AT RYAZAN PETROLEUM PROCESSING PLANT

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 10, Oct 83  
pp 12-13

SYCH, Yu. I., MUSIYENKO, G. G. and UMOV, O. A., Ryazan Petroleum Processing Plant

[Abstract] The Ryazan 1A/1M installation served well for some time before compressor failure and temperature maintenance problems caused waste. The authors report on renovations, such as installation of new 43 TsKO 160/15 centrifugal compressors and air cooling equipment. Dust extractors were reduced in number but modernized, catalyst loading improved and a cascade plate gas scrubber installed. Residue feed was shifted from the rectification column to the reactor, and an earlier innovation using pumps instead of grooved lower plates was corrected (since it had been unsuccessful). Changes in gas fraction collectors, heating and cooling systems are all part of the continuing modernization process.  
[44-12131]

UDC 665.644.2.096.5

#### OPERATION OF 43-103 APPARATUS AFTER REDESIGN OF DUST-COLLECTING SYSTEM

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 10, Oct 83  
pp 13-14

AKSENOV, A. A., MALYUSHCHITSKAYA, K. S. and VORONIN, V. V.,  
"Omsknefteorgsintez" Production Association

[Abstract] The 43-103 catalytic cracking plant of the "Omsknefteorgsintez" Production Association, which entered production in 1972, suffered from frequent slowdowns and stoppages due to catalyst waste, corrosion and other problems. As a result, the major overhaul in 1980-1981 was accompanied by significant modifications, particularly of the regenerator, which are reported in the present study. The original two-stage dust-catching system was replaced by a three-stage type and additional collectors mounted on the hot bunker with continuous return of catalyst into generator. The boiling layer was stabilized with a 4500mm by 3000 mm glass, and the condensor-coolers replaced with stainless steel clusters. Catalyst feed and operator position

were also improved. Although significant improvements resulted, catalyst is still being emitted into the atmosphere and left in final products, so that further corrections in operation are needed. Figures 2.  
[44-12131]

UDC 665.644.2(06)

## TWO-STAGE CATALYTIC CRACKING

Moscow KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL in Russian No 10, Oct 83  
pp 14-18

MARKHEVKA, V. I., STANKEVICH, V. A., LIVSHITS, R. S. and KOGAN, Yu. S.,  
All-Union Scientific Research Institute for Petroleum Production

[Abstract] The authors report on advances in two-stage catalytic cracking made at the All-Union Scientific Research Institute for Petroleum Production using amorphous aluminosilicate catalysts in a stepped counterflow system, resulting in increased aromatic products from the gas oil fractions. The semiproduction apparatus at the Gor'kiy test plant features electrical heating for close control, force hydrodynamic systems at all stages and highly effective catalyst regeneration. The first cracking stage occurs in a direct flow reactor of 0.094 m diameter and 22 m height, while the second stage is in a two-section stepped counterflow reactor. The regenerator has a forced boiling layer with gas flow rate of 0.6-1.2 m/sec, temperature of 600-700°C and pressure of up to 0.14 MPa. The production tests used West Siberian hydropurified vacuum gas oil of the 350-540°C fraction and a balanced KMTsR catalyst from a 1A/1M apparatus. Changes in yields of various fractions resulting from the deepening of cracking by the two-stage procedure are outlined. The gas oil obtained by severe cracking procedures was highly aromatic, and the content of heavy aromatic hydrocarbons of the 310°C fraction reached 80-82.3% by weight. The two-stage cracking process yielded highly aromatic gas oils with reduced crude oil conversion and corresponding higher output at up to 490°C in the direct flow reactor and 510°C in the stepped counterflow reactor. Another advantage of the described process is its flexibility. Figure 1; references 9 (Russian).  
[44-12131]

## NEW MICROSPHERICAL CRACKING CATALYSTS

Moscow KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL in Russian No 10, Oct 83  
pp 24-25

NEFEDOV, B. K., MELIK-AKHNAZAROV, T. Kh., STANKEVICH, V. A., GUSEYNOV, A. M.  
and IL'INA, L. M., All-Union Scientific Research Institute for Petroleum  
Production

[Abstract] The KMTsR zeolite-containing catalyst used at 1A/1M and GK-3 cracking installations has good stability, but its mechanical stability and density are insufficient for modern requirements. Second generation catalysts such as Microzeokar-5 and Microzeokar-8 satisfy these requirements, but their production lags. The present study reports on gel technology used to produce satisfactory microspherical catalysts by forming aluminosilicon-gel pellets, syneresis and coating the pellets with an aqueous solution of ammonium sulfate, pulverization and blending with a zeolite-containing compound and final drying and tempering. The process features careful regulation of density and porous structure of the aluminosilicate matrix through syneresis and liquid processing during activation. Tests of the resulting catalyst, labeled KMTsU, indicated 2-3% higher gasoline yield but somewhat reduced selectivity for coke and gas. Stability in operation, density and durability were improved. Production tests are continuing at the Novo-Baku Petroleum Production Plant imeni Vladimir Il'ich, Figure 1; references 4 (Russian). [44-12131]

UDC 665.644.2.096.5.013

## PERFECTING CATALYST TRANSFER AT 1A/1M INSTALLATIONS

Moscow KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL in Russian No 10, Oct 83  
pp 39-40

NAZARENKO, B. S., ODINTSOV, O. K., NAZARENKO, K. B. and FAREMAN, V. Ye.,  
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for Petroleum

[Abstract] Microspherical catalyst is usually delivered to 1A/1M-type cracking installations by hopper trucks or rail hoppers, which often have been manually loaded from paper sacks. There are frequent delays due to plugging, losses of catalyst and pollution, and needs for dried and degreased air. The present study presents a two-stage delivery system, the first consisting of a vacuum of up to 40-70 kPa and the second using air pressure of 200-600 kPa for final transfer to reactors. Details of pulverization, vacuum system and unloading from reactor to regenerator are diagrammed and summarized. This pneumatic transfer system sharply reduces air pollution

and loss of catalyst during transfer and equipment cleaning, and eliminates the intermediate step of pouring the catalyst from paper sacks into truck or train hoppers. Annual savings are estimated at 100-150,000 rubles. Figures 2.  
[44-12131]

## PHARMACOLOGY AND TOXICOLOGY

UDC 615.285.7.074

### CERIMETRIC DETERMINATION OF IMIPHOS

Moscow FARMATSIYA Vol 32, No 5, Sep-Oct 83  
(manuscript received 15 Dec 82) pp 41-43

TURKEVICH, N. M. and DMITRISHIN, R. T., Lvov Medical Institute

[Abstract] A method for quantitative determination of imiphos is described. An exact weighed sample (20 to 100 mg) of imiphos is dissolved in 100 ml of water; 10 ml of the solution obtained is acidified with dilute sulfuric acid (1:1) and to this is added a known quantity of 0.1 N solution of  $\text{Ce}(\text{SO}_4)_2$  in excess. The mixture is boiled 15 to 120 minutes, cooled and the Ce (IV) ions not entering into reaction are titrated with a 0.01 N solution of Mohr's salt in the presence of ferroin. Boiling the imiphos with Ce (IV) for 40 minutes consumes 12 eq of Ce (IV). In order to compare this method with a pharmacopoeial method, seven determinations of imiphos according to FS42-954--75 were conducted. The cerimetric method was more accurate with a relative error of the method  $\pm 1.71$  percent.  
[43-2791]

UDC 615.281:547.587.11].074

### CERIMETRIC DETERMINATION OF SOME DRUGS CONTAINING PHENOLIC HYDROXYL AND METHOXY GROUP

Moscow FARMATSIYA in Russian Vol 32, No 5, Sep-Oct 83  
(manuscript received 9 Mar 82) pp 43-48

KOKA, I. P., Belorussian Institute For Advanced Training of Physicians,  
Minsk

[Abstract] Methods of quantitative determination of phenol, resorcin, salicylic acid, sodium salicylate, acetylsalicylic acid, phenylsalicylate, physostigmine salicylate, papaverine hydrochloride, pethanol and adrenaline hydrotartrate, containing a phenolic hydroxyl and methoxy group in their structure, with the aid of the oxidizing agent cerium (IV) sulfate were described. Oxidation reactions for these agents are presented. The benzene ring in phenol, resorcin, salicylic acid, acetylsalicylic acid and phenylsalicylate is destroyed during oxidation by cerium (IV) sulfate with

formation of glutaric acid, formic acid and butyric acid. Phenolic hydroxyl in phetanol, adrenalin hydrotartrate and papaverine hydrochloride is oxidized (after hydrolysis) up to carbonyl with formation of quinones of these preparations. Benzoic acid, butyric acid, glutaric acid, formic acid, succinic acid and methyl alcohol are not oxidized by cerium (IV) sulfate at room temperature. References 8 (Russian).  
[43-2791]

UDC 615.31:577.152.165'133].015.4

#### PROTECTIVE AND THERAPEUTIC PROPERTIES OF $H_6CoQ_4$ AND $CoQ_9$ UBIQUINONES IN GAMMA IRRADIATION

Moscow FARMAKOLOGIYA I TOKSIKOLOGIYA in Russian No 6, Nov-Dec 83  
(manuscript received 24 Jan 83) pp 63-66

IL'YUCHENOK, T. Yu., SHADURSKIY, K. S. (Deceased), SAMOKHVALOV, G. I. and OBOL'NIKOVA, Ye. A., Scientific Research Institute of Medical Radiology, USSR Academy of Medical Sciences, Obninsk, Kaluga Oblast; Scientific-Industrial "Vitaminy" Association, Moscow

[Abstract] Studies were conducted on the radioprotective and therapeutic potential of the ubiquinone-9 ( $CoQ_9$ ) and hexahydroubiquinone-4 ( $H_6CoQ_4$ ) in outbred and  $F_1$  (CBA x C57B16) mice and Wistar rats, employing wide dosage range and time intervals for pre- and post-gamma irradiation and intragastric and subcutaneous administration. Both agents were found to be nontoxic under standard conditions and radioprotection depended on the dosage and time of administration. In  $F_1$  (CBA x C57B16) mice best radioprotective results were obtained with  $CoQ_9$  given subcutaneously or intragastrically (10 mg/kg) 30 min before irradiation (40-45% 30 day survival with 8 Gy). With  $H_6CoQ_4$  60% survival was obtained with subcutaneous administration (150 mg/kg; 30 min), and 40% with 10 mg/kg administered into the stomach 2 h before irradiation. In rats, 200-400 mg/kg of  $CoQ_9$  was effective by either route 10-120 min before irradiation with 6-7 Gy, but minimally effective or ineffective with 7.5-10 Gy. Administration of  $CoQ_9$  or  $H_6CoQ_4$  after irradiation for therapeutic purposes yielded variable results with the conclusion that they were essentially ineffective. Insolubility of these preparations in aqueous media is a major disadvantage, requiring the use of vegetable oil as a vehicle. References 16: 14 Russian, 2 Western.  
[69-12172]

## POLYMERS AND POLYMERIZATION

### COMPOSITION MATERIALS

Moscow EKONOMICHESKAYA GAZETA in Russian No 45, Nov 83 p 2

[Article prepared by the Department of Chemistry, USSR State Committee for Science and Technology: "Survey: Composition Materials"]

[Text] The development of production of new polymer and composition materials and products made from them with a set of specified properties is stipulated in the decisions of the 26th Party Congress. The importance of performing this task was stressed at the June (1983) Plenum of the CPSU Central Committee.

#### Effective Fiberglass

At the present time, plastics and synthetic resins intended for construction are being used with success in different sectors. In most cases, they are the basis for composition materials (called composites for short), i.e., complex systems, each component of which is "responsible" for imparting a given operating property. Most often, composites on a polymer base (matrix) have greater stability of shape, imperviousness to deformation, hardness and structural rigidity than the matrix material. This effect is achieved due to filling of the polymer with fibers and powders of mineral or organic origin.

Materials filled with fibers are generally referred to as being reinforced. Fiberglass is presently the most widespread of this category.

Items made of fiberglass, which have a specific strength (strength parameters related to unit of mass) that is several times greater than steel, are much lighter than metal parts, last longer and do not require protection against rust. Their manufacture and installation are less time consuming. Unfortunately, the needs in fiberglass of the national economy, particularly of the rust-resistant type, are still not being fully met.

One of the main reasons for this situation is disruption of planned target dates for starting up the shop for production of diphenylolpropane at the Khimprom [Chemical Industry] Association in Ufa, which includes production of the main raw material for the manufacture of rust-resistant polyester binders for fiberglass. It would not be superfluous to recall, for the USSR Ministry of Fertilizers and Ministry

of Industrial Construction, which are to blame for the delay in construction, that there is overexpenditure of up to 30,000 tons of stainless steel in our country because of the absence of rust-resistant polyesters.

There are provisions for development of the process of producing standard fiberglass elements and large sectional rust-resistant items and equipment based on them as one of the objectives in the scientific and technical program entitled "To develop and introduce new plastics and plastic products, highly productive automated processes and equipment for manufacture and processing of plastics." The existence of industrial technology will make it possible to use on a broader scale and with a greater economic effect large products and structures of fiberglass under the 12th Five-Year Plan.

#### Area of Application is Broadening

The need to further improve the strength and reduce the weight of items made of reinforced composites led to development of new reinforcement fibers, such as carbon, high-modulus organic and certain others. Carbon plastics, organoplastics and composites with hybrid (multicomponent) reinforcement systems, respectively, were developed on their basis.

For the time being, they are used in areas where it is impossible to solve current problems of technological progress with use of other materials.

In order to expand the area of application of composites that include carbon, organic fibers and hybrid systems, the cost of reinforcement materials must be reduced substantially. Elaboration of the measures needed for this is stipulated in programs dealing with the solution of the most important scientific and technical problems.

It is equally important to develop composites based on heavy-duty polymers, such as polyethylene, polypropylene, polyvinylchloride and others, in order to improve operating properties. This would permit expansion of the area of their effective use and improvement of economic indicators for production and use of heavy-duty thermoplastics.

Development of the plastics industry so that the needs of the national economy are fully met will require considerable investment of capital and time. For this reason, better use of existing polymer materials resources acquires special significance.

#### A Universal Method

The most important direction of improving use of polymer resources is to produce thermoplastics filled with minerals and other available materials. The combined special-purpose program, "Development of technology and industrial production of heavily filled and composite polymers, as well as pipes, sheets, machine-building, construction and other products out of them," provides for research in this field.

The program is based on the basically new method of producing filled thermoplastics involving development of a homogeneous polymer layer bound with the



surface of filler particles, which was developed by the Institute of Chemical Physics (ICP) of the USSR Academy of Sciences.

The method of physical mixing of prepared polymer with fillers, which is widely used abroad, makes it possible to add to the composition a limited amount of additives. And, to assure the required quality, the fillers are first treated with special finishes that enhance adhesion between components. The thermoplastics thus obtained have improved (or specific) service characteristics; however, they usually increase energy consumption for production, cost of material and do not have an appreciable effect with regard to saving organic raw material.

The method developed by the Institute of Chemical Physics solves a combined technical and economic problem, that of maximum filling, with retention or improvement of service characteristics of polymers, which yields a saving of organic raw materials and lowers the cost of polymer compositions. The universality of this method makes it imperative to push for development of optimum technological processes and equipment in order to make industrial use of it on a wide scale.

Extensive testing of samples of polymerization-filled materials (norplastics) manufactured in experimental units, rather than in the laboratory, revealed that their properties differ substantially from those of both pure and traditionally filled thermoplastics. For example, in processing norplastic into a product there is a decrease in the abrasive effect, which is inherent in filled materials. Norplastics have a high modulus of elasticity. In spite of high filling (30-50%), they retain their elasticity.

The method of polymerization filling yields a new class of composites based on available heavy-duty [large tonnage] raw material with a broad spectrum of service properties. These materials can be used well, not only in traditional but new areas of application.

It would be difficult to exaggerate the importance of work on superfilled (containing 80-90% filler) materials. On their basis, one can manufacture light-weight, noninflammable, heat insulating and ornamental construction products, new, more economical types of linoleum. Finally, the superfilled materials can serve as a nonabrasive and compatible filler in producing mixed compositions.

It is planned to raise production in the very near future of highly filled thermoplastics and products made out of them to 200,000-250,000 tons, as well as to create the capabilities for output of heat-insulated construction items made of superfilled materials amounting to 5 million cubic meters. This would reduce the use of organic, mainly petroleum, raw material (monomers and phenol binders in the production of insulation) by 350,000-400,000 tons, and would yield an economic effect of over 200 million rubles.

In accordance with the program, theoretical studies are continuing to define the mechanism of the processes and search for new areas of application of the

ICP method, including reliable protection of metal surfaces against rust, increasing strength of reinforced systems with a polymer matrix and for other purposes. There is a special assignment of developing highly productive and economical methods of producing modern high-modulus reinforcement fiber materials and products, as well as reinforced equipment on their basis. As a result, the material and technical base should be prepared for effective future use of modern reinforced composites in such sectors as farm machinery and motor vehicle manufacture.

#### Achievements and Problems

The novelty of the problem made it necessary, particularly at the early stages, to develop the required experimental base to refine technological processes, for which there are no analogues, for both the production of highly filled materials and turning them into products and semifinished products. The "Norplast," "Plastik" scientific production associations and other organizations under the Ministry of the Chemical Industry have worked well in this direction.

For the first time, scientifically validated technological specifications were defined for dispersed mineral fillers; a comparative study was made of methods of grinding mineral raw materials for surface activation of particles. It was found that mechanical activation of filler is important to improve its combination with a polymer. The technical conditions have been formulated for a number of highly filled brands of polyethylene. A specific assortment of plastic products has been proposed, for the manufacture of which it is expedient to use filled compositions with reduction of specific outlay of polymer raw material.

Equipment for production and processing of filled polymer materials is being developed together with the technological design organizations of the Ministry of Chemical and Petroleum Machine Building and Ministry of the Machine Tool and Tool Building Industry. Production has already begun of filled brands of plastic cable material based on polyvinylchloride. In 1983, several hundred tons of drainage pipes were manufactured from polyethylene that was highly filled by the activation method. Production of filled brands of other thermoplastics is at the preparation stage.

Large experimental batches of highly filled, superhigh molecular polyethylene, which was named "kompanor," were produced at the Guryev Chemical Plant by the method of polymerization filling. This material has unique impact and wear resistance.

Methods have been developed for processing kompanor into sheets, strips and other linear products. The areas of their application have been defined. They include mining, light, paper industries, agriculture machine building and others, where the requirements are high with regard to resistance to wear and shock. It is planned to start series production of kompanor in the second half of 1985.

Unfortunately, there are also some serious oversights. We refer, first of all, to the development of experimental production units for polymerization filling in both the liquid and gas phase.

According to plan, the first of these units should be on line in the first half of 1985. This involves technical retooling of one of the small, obsolete technological lines for polyethylene at the Guryev Chemical Plant. Only 1.5 years remain to the starting date, yet the planning work has not yet been finished by the Giproplast Institute [State Institute for the Planning of Establishments Producing Plastics and Semifinished Products] (M. Lavrinenko, director).

An experimental production unit for gas-phase polymerization of ethylene, containing up to 80-90% perlite, has been installed at the Stroyperlite [Perlite Construction] Combine in Mytishchi. However, the finishing work has been delayed. The Ministry of the Chemical Industry and, in particular, the Norplast Scientific Production Association should help the combine to expedite the start-up of the unit, especially since it is intended not only to refine the technology of manufacturing building products, but to solve a number of general technological problems dealing with the most promising gas-phase process of polymerization filling.

Some encouraging results have been obtained in the area of producing polymerization-filled polyvinylchloride at the Institute of Chemistry and Technology of Polymers imeni V. A. Kargin. To expedite industrial production, it would be desirable for the Ministry of the Chemical Industry to expeditiously solve the problem of establishing an experimental base.

Combined planning of scientific research and experimental work to the point of introducing its results into industry requires improvement. If necessary, one should organize more boldly temporary scientific production complexes and implement other measures, in accordance with the decree of the CPSU Central Committee and USSR Council of Ministers, "On Steps to Accelerate Scientific and Technological Progress in the National Economy."

10,657  
CSO: 1841/49

## POLYETHYLENE AS A CHALLENGE TO TEFLON

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 3 Nov 83 p 4

[Article: "Polyethylene Challenges Teflon"]

[Text] Teflon is considered to be the sturdiest plastic. It is used extensively in chemistry, aviation and construction. However, the fluorine contained in this polymer makes it complicated and expensive to produce. The specialists at the Plovdivskiy Chemical and Technological Institute have found a cheaper replacement for teflon--polyethylene. Catalysts--titanium and silicon compounds--impart the necessary strength to it. In the presence of these compounds, polymerization of ethylene occurs by the method of molecular layering. The base product, ultrahigh molecular polyethylene is similar to teflon in properties, it is not sensitive to alkali and acids and withstands a load of up to 50 tons per square centimeter.

10,657  
CSO: 1841/46

REACTION BETWEEN OLIGOMERS AND POWDERED DIAMOND SURFACE CONTAINING  
REACTIVE GROUPS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 272, No 6, Oct 83  
(manuscript received 9 Mar 83) pp 1399-1402

BRYK, M. T., BAGLEY, N. N., SMIRNOV, Ye. P., GORDEYEV, S. K., BURBAN, A. F.,  
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Institute of Colloid Chemistry and Water Chemistry imeni A. V. Dumanskiy,  
Ukrainian SSR Academy of Sciences, Kiev

[Abstract] Lack of reactive groups on the surface of diamond powders is a factor preventing the formation of composite polymeric materials, and presence of such groups would permit modification of powdered diamond surface by condensation grafting of monomers or oligomers. In addition, interaction of such groups on the diamond surface with functional groups on the monomers or polymers would promote solidification. Studies with samples of powdered diamond ASM-0.5/0 modified to contain surface groups (Cl, COOH, or NH<sub>2</sub>) to a concentration of ca. 11 mcmoles/m<sup>2</sup> showed that such samples bound epoxide resin ED-20 from toluene to a concentration of  $2.5 \times 10^6$  kg/m<sup>2</sup>,  $6.0 \times 10^{-6}$  kg/m<sup>2</sup>, and ca.  $20 \times 10^{-6}$  kg/m<sup>2</sup>, respectively. Furthermore, heating at 453°K for 24 h led to the formation of unextractable resin on the diamond surface which was related to the degree of filling of ED-20, and IR spectra showed an increase in the intensity of absorption of C-O-C bonds at the expense of epoxy group and COOH and OH absorption. Additional studies also demonstrated the binding of phenol-formaldehyde resin to diamond surface containing Cl and COOH groups, and solidification within 1800 secs at 453°K with various degrees of filling, thereby confirming the grafting and solidification of these two resins to diamond surface containing reactive groups. Figures 3; references 8: 7 Russian, 1 Western.  
[58-12172]

## SYNTHESIS AND STRUCTURE OF TIN ORGANIC POLYMERS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 25, No 10, Oct 83  
(manuscript received 15 Apr 82) pp 2061-2064

MISHCHENKO, V. F. and ZUBOV, V. A., Simferopol State University  
imeni M. V. Frunze

[Abstract] In a preceding paper it was shown that biological activity of tin organic polymers (TOP) depended on their structure. The polymers with isotactically-distributed biocidal groups (BG) were more effective than TOP with syndiotactic distribution of BG. The goal of the present study was to synthesize and investigate structural characteristics of polymers with isotactically-distributed tin organic groups. A number of polymers was obtained from bis-tri-n-butyltin oxide and polymethacrylic acid. The paper analyzes in detail their IR spectroscopic data in relationship to possible structural characteristics. Figure 1; references 7: 5 Russian, 2 Western. [45-7813]

UDC 541.64:615.47

## DESTRUCTION OF SURGICAL SUTURES FROM POLYVINYL ALCOHOL

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 25, No 10, Oct 83  
(manuscript received 22 Apr 82) pp 2085-2089

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Institute of Textile and Light Industry imeni S. M. Kirov

[Abstract] Surgical sutures prepared from polyvinyl alcohol polymer were studied by implanting them in rat muscle tissue for periods lasting from 7 to 177 days. Concurrently, suture destruction was modelled by immersion in borax, 0.1 N NaOH and 2.5% boric acid solutions. In animal tissues, the sutures showed a 90% degradation in 6 months; the structure of the remaining filament did not differ much from the original material; the anisotropy was decreased and the cross dimensions of  $L_k$  crystallites were increased by about 20 Å. The modelling tests indicated that the strength of these sutures depended on tension and possible compressions exerted on them by the surrounding tissues. Figures 2; references 9: 7 Russian, 2 Western. [45-7813]

## FORMATION CHARACTERISTICS OF SUPERMOLECULAR STRUCTURE IN FILMS OBTAINED FROM DIANHYDRIDE OF 3,3',4,4'-DIPHENYLOXIDETETRACARBOXYLIC ACID AND VARIOUS DIAMINES

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 25, No 10, Oct 83  
(manuscript received 29 Apr 82) pp 2096-2102

SIDOROVICH, A. V., BAKLAGINA, Yu. G., MIKHAYLOVA, N. V., PROKHOROVA, L. K., SHCHERBAKOVA, L. M. and KOTON, M. M., Institute of High Molecular Weight Compounds, USSR Academy of Sciences

[Abstract] Aromatic polyimides can be obtained by single or two stage methods, the first being often more advantageous. In some cases it is possible to perform a single stage polymerization of 3,3',4,4'-diphenyloxide-tetracarboxylic acid dianhydride (DOTA) during low or high temperature polycondensation. To find the structural characteristics which could be related to the single stage polymerization, X-ray, dilatometric and IR spectral studies were performed on the following DOTA-based polymers with various diamine fragments: p-phenylene (PP), diphenyl (D), fluorene (F), bis(phenylamide)terephthalic acid (PAT), bis(phenylamide)isophthalic acid (PAI) and DOTA itself. It was shown that there indeed is a correlation between the structure of the diamine component and promotion of the one stage polycondensation process. When rigid diamine fragments were used--PP, D, F., and PAT--the formation of mesomorphic film structure was favored. When DOTA or PAI were used as diamine components, the chain flexibility was increased leading to an amorphous structure, preventing formation of aggregates in the reaction mixture and thus promoting the single stage polycondensation. Figures 6; references 10 (Russian).

[45-7813]

## USE OF MAGNESIUMORGANIC COMPOUNDS AND ALKYLALUMINUMMAGNESIUM COMPLEXES IN ZIEGLER CATALYSTS FOR SYNTHESIS OF CIS-1,4-POLYISOPRENE

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 25, No 10, Oct 83  
(manuscript received 30 Sep 82) pp 2103-2107

BRESLER, L. S., KISIN, K. V., LUBNIN, A. V. and MARASANOVA, N. N., All-Union Scientific Research Institute of Synthetic Rubber imeni S. V. Lebedev

[Abstract] Recently, superactive Ziegler-Natta catalysts were developed by reduction of  $TiCl_4$  with ether-free Grignard reagents or complex magnesium-aluminum organic compounds. The use of these catalysts in polymerization of isoprene was investigated. The activity of these catalysts was found to be lower than that of the system  $TiCl_4-Al(iso-Bu)_3$ . Whereas polymerization of isoprene was slowed down, ethylene polymerization occurred at an excellent

rate. It was proposed that isoprene polymerizes on different "active centers" of the catalyst than does ethylene. The microstructure of the polymer formed depends on the ratio of  $[R-Mg]:[TiCl_4]$ . Addition of aluminum-organic compounds had no effect on the polymer structure. Figures 2; references 13: 5 Russian (2 by Western authors), 8 Western.  
[45-7813]

UDC 541.64:547(538.141+315.2+253.4)

POLYMERIZATION IN BUTADIENE-STYRENE SYSTEM UNDER INFLUENCE OF LITHIUMORGANIC ACTIVE CENTERS IN PRESENCE OF SUBCATALYTIC QUANTITIES OF TETRAMETHYLETHYLENEDIAMINE

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 25, No 10, Oct 83  
(manuscript received 4 May 82) pp 2121-2125

YERUSALIMSKIY, B. L., DAVIDYAN, A. A., NIKOLAYEV, N. I., ZGONNIK, V. N., BELEN'KIY, B. G., KRASIKOV, V. D., NESTEROV, V. V. and KONONENKO, M. L.,  
Institute of High Molecular Compounds, USSR Academy of Sciences

[Abstract] The effect of subcatalytic amounts of tetramethylethylenediamine (TMDA) on low-temperature polymerization in the system butadiene-styrene-oligo-butadienyllithium-toluene was investigated. Fractional composition of reaction products is tabulated. Lowering the polymerization temperature resulted in lower exchange between associated and monomeric forms of polybutadienyllithium. The activity of lithiumorganic agents in non-polar medium could be arranged in the following ascending order:  $(M_nLi)_m < (M_nLi)_m \cdot D < M_nLi \cdot D < M_nLi$ , where  $(M_nLi)_m$  = associated form,  $M_nLi$  = the monomeric form and D = strong electron donor. It was shown thus that complex formation with TMDA decreased the reactivity of monomeric forms of active centers but activated their associated forms. Figure 1; references 9: 3 Russian, 6 Western (all by Russian authors).  
[45-7813]

UDC 541.64:532.135

STUDY OF RHEOLOGICAL PROPERTIES OF POLYMER MELTS IN PRESENCE OF HYDROSTATIC PRESSURE

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 25, No 10, Oct 83  
(manuscript received 6 May 82) pp 2126-2131

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[Abstract] The goal of the present study was to obtain quantitative data on the behavior of polyorganosiloxane rubbers at various temperatures and



pressures. To achieve this goal, a capillary viscosimeter and dilatometer were constructed permitting tests to be conducted up to 500 MPa in temperature range 280-380 K. This instrument is described in detail. Using this apparatus, viscosity and specific volumes of polyorganosiloxane rubbers were determined for various MWs. It was shown that the volume decrease due to hydrostatic compression obeyed Tate's equation. Analysis of experimental results showed that viscosity is a function of density. Figures 6; references (Russian). [45-7813]

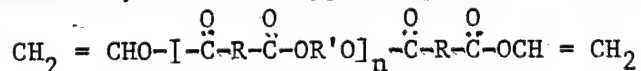
UDC 541.64:542.952

#### SYNTHESIS OF VINYL OLIGOESTERS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 25, No 10, Oct 83 (manuscript received 7 May 82) pp 2132-2138

NEROZNIK, V. G., ZADONTSEV, B. G., SIVERGIN, Yu. M. and ZAPADINSKIY, B. I., Ukrainian Scientific Research Institute of Plastics; Institute of Chemical Physics, USSR Academy of Sciences

[Abstract] Syntheses of unsaturated vinyl alcohol type oligomers were described with the general formula



where R = dicarboxylic acid, R' = glycol and n = degree of oligomerization. Two stages were identified in this synthesis. The first represented oligocondensation of dicarboxylic acid and glycol at 463-473 K and at reduced pressure; this step occurred almost quantitatively in 1.5-2 hrs. The second stage represented conversion of oligoester-acid into vinyl oligoester in presence of a catalyst. To verify whether the reaction did proceed in this fashion, molecular weight distribution (MWD) of the starting oligoester-acids and vinyl oligoesters was studied. Transvinylization of oligoester-acids was found to be a reversible reaction and a special method was developed to remove formed acetic acid from the reaction medium. To prevent polymerization of the reagents, hydroquinone was added as an inhibitor. Vinyloligoesters are useful in production of polymers for electrotechnical and construction application. Figures 6; references 6: 5 Russian, 1 Western. [45-7813]

## PROPERTIES OF POLYURETHANE IONOMERS CONTAINING ANIONIC GROUPS IN BASIC CHAIN

Kiev UKRAINSKIY KHMICHESKIY ZHURNAL in Russian Vol 49, No 9, Sep 83  
(manuscript received 6 Sep 82) pp 981-984

GREKOV, A. P., LEVCHENKO, N. I. and SUKHORUKOVA, S. A., Institute of Chemistry of High Molecular Weight Compounds, UkSSR Academy of Sciences, Kiev

[Abstract] Novel polyurethane ionomers (PUI) were synthesized and their chemical, physical and mechanical properties were investigated. The diamine, which normally acts as a chain propagator, was replaced with various bifunctional hydrazine derivatives: dicarboxylic, alkyl, thioalkyldicarboxylic and disulfonic acids, hydrazine hydrate, semicarbazide, dihydrazides, etc. The isocyanate component was the 1,6-hexamethylenediisocyanate; polyhydroxytetramethyleneglycol served as the oligoether component. The PUI properties were tabulated. Hydrazine derivatives were better chain propagators than ethylenediamine derivatives. These products exhibited good surfacting activity. Figures 3; references 4: 3 Russian, 1 Western.  
[25-7813]

UDC 541.6 + 541.183 + 542.952.6

ADSORPTION POLYMERIZATION OF METHYLMETHACRYLATE ON DEHYDROXYLATED SURFACE OF  $\alpha$ - $\text{Al}_2\text{O}_3$ 

Kiev UKRAINSKIY KHMICHESKIY ZHURNAL in Russian Vol 49, No 9, Sep 83  
(manuscript received 12 Aug 83) pp 985-988

LOGVINENKO, P. N., Institute of Chemistry of High Molecular Weight Compounds, UkSSR Academy of Sciences, Kiev

[Abstract] The goal of the present study was to investigate active centers of a completely dehydroxylated surface of  $\alpha$ - $\text{Al}_2\text{O}_3$  and of the effect of polymerization conditions on the conversion of adsorbed monomers. A completely dehydroxylated surface of  $\alpha$ - $\text{Al}_2\text{O}_3$  was obtained by heating the specimen to  $960^\circ\text{C}$  in vacuum ( $P = 3 \cdot 10^{-7}$  Torr) for 20 hrs. Using IR spectral analysis of surface compounds obtained with test molecules such as methylacetate, methylisobutyrate or methylisovalerate, it was shown that there are three types of coordination unsaturated metal cations on the surface of  $\alpha$ - $\text{Al}_2\text{O}_3$ . It was proposed that the polymerization of methylmethacrylate centers was initiated by mononuclear surface  $p$ - $\pi$ -complexes of Methylmethacrylate  $\rightarrow \text{Al}^{3+}$  which are capable of opening the vinyl bond on impact with adsorbed neighboring molecules or with the vapor phase monomer. Figures 5; references 14: 10 Russian, 4 Western.  
[25-7813]

## SILICONORGANIC CARBOFUNCTIONAL OLIGOMERS

Kiev UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian Vol 49, No 9, Sep 83  
(manuscript received 3 Dec 82) pp 989-993

LASKOVENKO, N. N., Institute of Chemistry of High Molecular Weight Compounds,  
UkSSR Academy of Sciences, Kiev

[Abstract] Synthesis of siliconorganic carbofunctional oligomethanes with high content of silicon or cyclic fragments in the oligomeric chain was investigated. Siliconorganic oligomers with terminal isocyanate groups containing elevated levels of siloxane links were obtained by reacting siliconorganic diisocyanates with siliconorganic silarenyletherdiols. The reaction gave satisfactory yields at 50-100°C in presence of tin octanoate as the catalyst. The oligomers were tarry substances soluble in benzene, DMFA, dioxane and other organic solvents. Molecular weight ranged from 1500 to 9000. The degree of polymerization, elemental analysis, the content of terminal groups, yields and the IR spectral data are reported.

References 10 (Russian).

[25-7813]

## DIFFUSION DESORPTION OF PLASTICIZERS AS MAIN FACTOR OF AGING OF POLYVINYL CHLORIDE PLASTIC COMPOUNDS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 272, No 4, Oct 83  
(manuscript received 7 Apr 83) pp 889-891

BRAGINSKIY, R. P.

[Abstract] Samples of polyvinyl chloride (PVC) plastic compounds subjected to thermostatic aging at 70° C, and lower, and samples studied after storage of up to 25 years (effective temperature 17° C) indicated that diffusion desorption of the plasticizer is the only process determining aging of PVC plastic compounds. The level of plasticizers in PVC plastic compounds definitely determines the totality of important performance properties of the material. Correlation between plasticizer-level and properties, detected in use of special compositions which differ from standard compositions in plasticizer content, make it possible to predict changes of properties of PVC plastic compounds in the aging process. Incorporation of ideas of the theory of flow makes it possible to propose a mathematical model of the aging process. The established mechanism of aging of PVC plastic compounds during performance in moderate temperatures make it possible to predict change in properties and service life of PVC plastic compounds (and materials made from them) on the basis of study of the kinetics of the process of

desorption of the plasticizers and determination of the current level of plasticizers in the PVC plastic compounds. Figures 4; references 2 (Russian). [32-2791]

UDC 678.766:532.72:547.391.1:66.085.33

#### RADIATION GRAFTING POLYMERIZATION OF ACRYLIC ACID ON POLYIMIDE FILM

Moscow PLASTICHESKIYE MASSY in Russian No 10, Oct 83 pp 9-10

RESHETILOVA, T. I., SIDOROVA, L. P, and KABANOV, V. Ya,

[Abstract] Radiation-grafting-polymerization is widely used in modifying the properties of many polymers. Because of the fact that literature data is scarce on this technology application to polyimides, this present study was aimed at analyzing this technique. Under a wide range of reaction conditions the degree of grafting was in the range of 3-3.5%. The adsorbed radiation dose had little effect on the degree of grafting, but duration of the radiation did have an effect. Water and methanol favored grafting polymerization. Several other modifications of grafting conditions had no significant effect on the process. This was explained on the basis of steric hindrance: restriction of the growth of grafted chains inside a rigid cyclic chain structure of the polyimide. [51-7813]

UDC 678-13:547.339.211:547.538.141.01:65.018

#### PHYSICAL-MECHANICAL CHARACTERISTICS OF METALLIZED ABS PLASTICS

Moscow PLASTICHESKIYE MASSY in Russian No 10, Oct 83 pp 10-11

ZOLOTOVA, V. I, and FADEYEVA, N. K,

[Abstract] The quality of metallized products is usually evaluated by a subjecting the articles to cyclic temperature alterations and by measuring the adhesive capacity of the metallic plating to the polymer. Theoretical analysis of forces acting on this system is reported. On the basis of these considerations it was concluded that evaluation of metallized products should be performed by testing under thermal stress. The thermal cycle should be selected with due consideration of conditions under which they are used and the heat stability and freezing strength of the polymer. The advantage of this method is that it is applicable to any shape of the final product and not just to flat planes. References 2: 1 Russian, 1 Western. [51-7813]

STRUCTURE FORMATION OF SILICONORGANIC BINDERS ON SURFACE OF FIBERGLASS  
FILLERS

Moscow PLASTICHESKIYE MASSY in Russian No 10, Oct 83 pp 13-15

DZHAVAKHISHVILI, E. A., D'YACHENKO, B. I., KUSHAVSHVILI, Zh. K.,  
TOPCHIASHVILI, M. I. and SHAVLIASHVILI, N. R.

[Abstract] In an attempt to explain the mechanism of strengthening fiberglass and the effects of individual factors on structural properties of this material, microscopic investigation of polymer matrix was carried out. The data indicated that EZ-100 fiberglass treated with polymethylsilsesquioxane (PMSO) showed a low ( $640 \text{ N/cm}^2$ ) microhardness, which nevertheless increased to  $2340 \text{ N/cm}^2$  after thermal treatment. This could be increased even higher when modified PMSO were used to treat the fiberglass. To obtain fiberglass with improved physical and mechanical properties, material should be used with special direct lubricant which improves adhesion of the binder to the matrix. The best indices were shown by EZ-100 fiberglass treated with modified PMSO and 5% dispersed mineral filler. Even though its strength was average ( $3600 \text{ N/cm}^2$ ), it exhibited much lower lamination.

References 8 (Russian).

[51-7813]

UDC 678.643'42'5.01:53

## PHYSICAL-MECHANICAL PROPERTIES OF POLYCOMPONENT EPOXYPOLYMERS

Moscow PLASTICHESKIYE MASSY in Russian No 10, Oct 83 pp 15-17

LIPSKAYA, V. A., VOLOSKOV, G. A., SOLONITSYNA, V. A., GONCHAROVA, O. V. and  
VOLOSHKIN, A. F.

[Abstract] The effect of the nature of the modifiers (solvents, plasticizers) and of the quantitative content of a polycomponent epoxy composition on its technological, physical-mechanical properties and residual tension was studied. It was shown that introduction of a solvent into an epoxide composition improved its technological and strength characteristics and increased the residual tension; the content of a plasticizer increased deformational ability and relaxation properties of the polymer. The lowering of residual tension appeared as an exponential function of the content of plasticizer. Optimal ratio of starting epoxy compounds in polycomponent polymers could be calculated from the kinetic equation of parallel reactions. Figure 1; references 4 (Russian).

[51-7813]

# PHYSICAL-MECHANICAL PROPERTIES OF SOLIDIFIED EPOXY-RESIN MATERIALS AT CRYOGENIC TEMPERATURE

Moscow PLASTICHESKIYE MASSY in Russian No 10, Oct 83 pp 22-23

NIKOLAYEV, A. F., KARKOZOV, V. G., DROZDOV, V. V., YAKOVLEVA, L. I., VERKHOGLYADOVA, T. Yu. and MURADKHANOV, V. A.

[Abstract] Potential utilization of polymers at low temperature is predetermined by their specific properties: low density, heat conductivity and high strength. Physical-mechanical properties of solidified epoxy-resin block copolymers were studied at cryogenic temperatures in original state and modified with polyvinylbutyral. The most stable properties were maintained with nonmodified epoxy-resin block copolymer which was more homogeneous, had a cleaner crosslinkage and exhibited fewer changes in its strength characteristics in temperature range from 20 to  $-253^{\circ}\text{C}$ . Due to low heat-conductivity coefficient of the copolymers studied, there was considerable difference between the exposed surface layers and the internal ones; most of the defects evidently formed during thermal cycling in the surface layers. References 6: 5 Russian, 1 Western, [51-7813]

UDC 678.674'41':678.027.74

# OPTIMAL CASTING CONDITIONS FOR PRODUCTS MADE OF POLYCARBONATE

Moscow PLASTICHESKIYE MASSY in Russian No 10, Oct 83 pp 34-35

KUMACHEV, A. I., BRAZHNIKOVA, L. Yu., MATUSEVICH, P. A., SHAYTANOV, V. L. and LAPIDUS, L. L.

[Abstract] Utilization characteristics of cast products are determined by technology of casting. An attempt was made to determine optimal conditions for casting a ventilator body (with a steel bushing) from polycarbonate (PK) by the method [Box-Wilson] of planning a fractional factorial experiment with divisibility of response  $1/8$ . The items used in this test were made of PK, trade mark PK-2, cast in the KuASu 1400/250-1 machine. It was discovered that the greatest effect on the quality of the products obtained under different conditions was exhibited by shaping temperature, injection pressure and the time a cast was kept under pressure. The method of planning a polyfactorial experiment permits almost complete exclusion of randomness in searching for optimal conditions for processing thermoplastics; it provides an individual approach in solving optimization of conditions for processing constructional thermoplastics into items to be used. References 6: 5 Russian, 1 Western. [51-7813]

## RADIATION-CHEMICAL SOLIDIFICATION OF EPOXYOLIGOESTERACRYLATE COMPOSITIONS

Moscow PLASTICHESKIYE MASSY in Russian No 10, Oct 83 pp 38-39

PRISHCHEPA, N. D., FAYZI, N. Kh. and SHIRYAYEVA, G. V.

[Abstract] Epoxy oligomers are the principal components of compounds used as air tight-sealers in radioelectronic equipment. The epoxy ring is resistant to radiation. This creates a series of technological problems. In the present paper, synthesis is described of air-tight compositions containing epoxy oligomers which could be solidified with 0.4-0.5 MHz doses. Experimental evidence indicated that the compounds based on methacrylic epoxy resins surpass corresponding materials based on non-modified resin with respect to their solidification kinetics and viability. This is evidently due to the fact that the use of methacrylic epoxy oligomers in these compositions leads to the formation of a tri-dimensional network during solidification with considerably denser crosslinkage than in compositions based on a starting epoxy oligomer with radiationally non-sensitive  $\alpha$ -oxide rings. Figures 3; references 6: 5 Russian, 1 Western.

[51-7813]

## ACTIVATION OF FINE FLUOROPLASTIC FILM SURFACE

Moscow PLASTICHESKIYE MASSY in Russian No 10, Oct 83 pp 39-41

SKOROBOGATOV, A. A., ALEKSEYEV, O. V. and BEN'KOVA, L. F.

[Abstract] Fine fluoroplastic films are currently used in many industrial applications. However, fluoroplastic exhibits low adhesive properties which limit its application. The goal of the present study was to investigate in greater detail the activation process of surface adhesive bonds of fluoroplasts by means of the glow discharge method. The experiments were based on a thin film of the F-4MB-2 fluoroplast. A mathematical model was developed capable of predicting future experimental directions with necessary accuracy based on incomplete second degree polynome in which all possible interactions were considered. Regression analysis showed that the effect of various factors on the activation of surface adhesive bonds of fine fluoroplastics varied in a wide range. The greatest effect was shown by discharge voltage followed by about an identical effect of the duration of treatment of the polymer in glowing discharge and the pressure in vacuum chamber at ignition discharge. Overall, it was concluded that the activation energy of the surface adhesive bonds depends on chemical side reactions of the polymer macromolecules and not on the electric background. Figure 1; references 5 (Russian).

[51-7813]

DIRECTIONS AND EFFECTIVENESS OF UTILIZING SOME CONSTRUCTION THERMOPLASTICS  
IN NATIONAL ECONOMY

Moscow PLASTICHESKIYE MASSY in Russian No 10, Oct 83 pp 51-53

ROSHCHIN, M. A., SHTOPOROVA, T. I., VORONKOVA, L. D., MECHETOVICH, S. B.,  
PLATONOVA, O. V., BAZAROVA, L. V. and KLEMENOV, V. N.

[Abstract] The ever increasing utilization of synthetic resins and plastic materials in all aspects of national economy is the result of their high economic effectiveness as replacements for traditional materials, simplicity of their production and, finally, advances in technology. In the present paper mention is made of the many industries in which plastic materials have replaced metals, alloys, glass and other "standard" construction materials. Where available, economic data are reported in production cost and labor savings. Virtually all industries: construction, aviation, electronic, automobile, transportation, machinery, etc., are shifting to plastic material. This process will continue along with further modification and refinement of polymers,  
[51- 813]

UDC 677.494.745.32-913.3:661.185-322.2

## IMPARTING LONG LASTING ANTISTATIC PROPERTIES ON POLYACRYLONITRILE FIBER

Moscow KHIMICHESKIYE VOLOKNA in Russian No 5, Sep-Oct 83  
(manuscript received 16 May 83) pp 38-39MIL'GROM, A. Ye., ANDRIANOVA, L. N., BEDER, N. M., ANUFRIYEVA, V. I.,  
SHUBENKIN, N. G. and CHUDINSKAYA, T. A.

[Abstract] Ability to impart long-lasting antistatic properties to freshly formed polyacrylonitrile (PAN) fibers is evaluated. The surface of the test fibers was treated with (C<sub>10</sub>-C<sub>18</sub>) alkylbenzyltrimethylammonium salt of (C<sub>11</sub>-C<sub>18</sub>) alkylsulfonic acid (Katonat). Katonat is insoluble in water but dissolves freely in organic solvents and is quite thermostable. Results performed in laboratories and on industrial scale showed that Katonat imparted stable antistatic effect on PAN fibers with no undesirable hygienic, health or physical properties. References 6 (Russian).  
[48-7813]



POLYPHENIC REINFORCEMENT FABRIC FOR ION EXCHANGE MEMBRANES

Moscow KHIMICHESKIYE VOLOKNA in Russian No 5, Sep-Oct 83  
(manuscript received 9 Feb 82) pp 43-44

SLIN'KO, L. V., OVCHINNIKOVA, M. V., KUZ'MINA, Ye. I., ANDREYEVA, N. V.  
and KOKHANOVA, Ye. A.

[Abstract] To be useful in industrial processes, ion exchange membranes must possess high mechanical strength, low electric resistance and should not tear easily. To combine the first two requirements, chemically and thermally stable polyphenic fabrics were developed to reinforce existing membranes. One of the disadvantages of polyphenic fabric is considerable shrinkage. To lower this shrinkage, the fabric was stabilized by a thermoconvective method. Conveniently, this process also strengthened the threads, resulting in a more stable fabric. To increase this even more, a new type of crossweaving was proposed, but could not be realized on a large scale due to nonavailability of proper weaving equipment. Figure 1; references 4 (Russian), [48-7813]

EFFECT OF IONIZING RADIATION ON PROCESS OF CHROMATOGRAPHIC SEPARATION OF  
RARE EARTH ELEMENTS: SEPARATION OF LIGHT RARE EARTH ELEMENTS

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 57, No 10, Oct 83  
(manuscript received 9 Apr 82) pp 2511-2515

FIRSOVA, L. A., CHUVELEVA, E. A., KHARITONOV, O. V. and NAZAROV, P. P.,  
USSR Academy of Sciences; Institute of Physical Chemistry, USSR Academy of  
Sciences, Moscow

[Abstract] Displacement chelation chromatography was used to study the behavior of light rare earth elements (REE) in a field of ionizing radiation after elution of them by a solution of sodium diethylenetriaminopentaacetate (DTPA), with Ku-2 and Ku-4 as cationites. Separation of Ho and Nd on cationite Ku-2, in Zn form, with a 0.05 M solution of DTPA without irradiation and after various doses showed an increase of broadening of chromatographic fronts of Ho with an increase of absorbed dose. This was not true for Nd under the same conditions but there is, in this case, reduction of the REE concentration in the eluate indicating significant breakdown of DTPA upon irradiation. Calculation of the boundary coefficients of separation of Ho and Nd for a process proceeding under irradiation is presented. Separation of light REE is first accompanied by a small increase of pH of the REE filtrate with the increase of the absorbed dose and then reduction of concentration of the eluted elements and breakdown of the eluent and adsorbent. Figures 3; references 4 (Russian).  
[71-2791]

## RUBBER AND ELASTOMERS

### SUPERTIRE PRODUCTION STARTED IN THE USSR

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 25 Oct 83 p 1

[Article by V. Kurapin, Yaroslavl: "Assembly of Giant Tire"]

[Text] "Do you know how much the tire for the BelAz 120-ton dump truck weighs?" asked V. Gudynin, chief engineer of the Polimer mash [Polymer and Machinery] Plant asked. "Over 2 tons!" Until recently, such Herculean 'footwear' for motor vehicles had not been produced in our country, there was no equipment to assemble it. We had been compelled to purchase tires for the superpower dump trucks in Japan and France.

A team of specialists at the Yaroslavl NIIshin mash [Scientific Research Institute of Tire-Making Machinery?], headed by L. Shadin, designed a unique unit for assembly of tires for the 120-ton BelAz dump truck. The Polimer mash workers were given the task of setting up series production of this equipment. Today, it can already be stated that this responsible task has been performed and the giant unit is in series production.

It weighs about 60 tons completely outfitted. It can be used to assemble tires up to 3 meters in diameter. It is also notable for a high level of mechanization and automation of work operations, which provides for high labor productivity and reliable product quality.

The first unit built at Polimer mash has undergone a successful interagency testing at the Dnepropetrovsk Scientific Research Institute of Large Tires. The commission members immediately gave their approval for awarding it the state Quality Emblem. In the course of its testing and introduction, this unit already produced many tens of tires for 120-ton trucks. This means that the national economy has saved hundreds of thousands of rubles spent on foreign purchases. Here too, in Dnepropetrovsk, another unit has undergone testing, which was developed by designers and machine builders of Yaroslavl. It is intended for assembly of tires for the 180-ton BelAz dump trucks.

The Bobruyskshina [Bobruysk Tire] Association will have to become the main supplier for the giant dump trucks. Polimer mash was assigned to provide it with assembly units. Even now, the machine builders have the obligation to deliver six such giants to the Belorussian tire makers.

"We shall not let them down. As long as the parts and items to make up complete units are available," said brigade leader V. Dubov, the most experienced expert in lathe assembly.

This confidence is based not only on the labor enthusiasm of the workers, but new unit-by-unit organization of assembly. For example, the brigade of V. Dubov produces the hydraulic units that deliver oil to the lathe system under pressure of 60-80 atm. The brigades of N. Kozlov, V. Smirnov, N. Prokof'yev and M. Ovchinnikov are specialized for specific units. And the best fitters in the plant, V. Dubov, V. Vorontsov, V. Pomerantsev and others, will perform the overall assembly of the units. Unit-by-unit assembly makes it possible to improve the quality of work and labor productivity of mechanics; it will diminish significantly the laboriousness of manufacturing the equipment. All six feeders and a complete set of assembly drums have already been shipped to the Bobruyskshina Association. At the present time, the lathes included in the units are at the assembly stage.

10,657  
CSO: 1841/46

UDC 678,046.3:678.762.2:620.192.41

EFFECT OF ASBESTOS ON CRYSTALLIZATION AND MELTING OF CIS-1,4 POLYBUTADIENE

Moscow KAUCHUK I REZINA in Russian No 10, Oct 83  
(manuscript received 24 Mar 83) pp 7-9

SEVERINA, N. L., GAL'PERINA, N. M. and BUKHINA, M. F., Scientific Research  
Institute for Rubber Production

[Abstract] Studies of crystallization and melting of cis-1,4 polybutadiene (SKD) usually employ industrial carbon and aerosyl fillers, but recent advances suggest that long-fiber asbestos is a preferable filler. The present article reports on use of such asbestos as a filler in vulcanized rubbers, employing differential scanning calorimetry in a nitrogen-helium medium and differential thermal analysis in liquid nitrogen. Kinetics of isothermal crystallization were studied by a reduction method in a coolant of ethanol and liquid nitrogen. With 50 or more parts-by-weight of asbestos, the filler formed nuclei causing non-isothermal crystallization and spread of the melting range; with 200 parts of asbestos, the surface of endothermal peaks could not be measured. Decreased reductibility with higher asbestos content failed to display expected amorphous features in deformed samples. Thus, use of asbestos in stressed applications of cold-resistant rubbers is not recommended. Figures 3; references 8: 7 Russian, 1 Western.  
[52-12131]

UDC 678.743:678.473.3:541.24:539.612:665.935

RELATION OF MOLECULAR WEIGHT AND ADHESION PROPERTIES OF CHLORINATED ISOPRENE RUBBERS

Moscow KAUCHUK I REZINA in Russian No 10, Oct 83  
(manuscript received 1 Feb 82) pp 9-11

VOSKANYAN, E. S., TOROSYAN, K. A. and YUTUDZHYAN, K. K., "Nairit" Scientific  
Production Association

[Abstract] Chlorinated rubbers are used widely in both cold and hot cellular compositions, but published data on them are few and contradictory. The

present article reports on the effect of molecular weight of a polymer on its adhesion properties during attachment to metal during vulcanization. Model glues based on polymers dissolved in n-xylene and composition glues were prepared at temperatures below 35°C, and molecular weight and viscosity compared. Results showed that as molecular weight of chlororubbers increased from  $2.8 \cdot 10^4$  to  $12.7 \cdot 10^4$ , the strength of attachment in model glues and rubbers based on SKN-26M more than tripled; further increases in molecular weight had little impact. Use of high-molecular weight chlororubber glues assured dependable attachment of nitrile resins to metals and increased cohesion durability, but the breadth of molecular weight distribution grew and appeared as both a molecular and compositional heterogeneity. Study of the degree of chlorination and its effect on adhesion showed that excess chlorine content brought failure of the polymer. Technical difficulties of production limit the application of the tested high-polymer glues. References 10: 9 Russian, 1 Western (US patents).  
[52-12131]

UDC 678.762.3.046.2.002.612

# EFFECT OF RUBBER-INDUSTRIAL CARBON REACTION ON PROPERTIES OF RESINS BASED ON SKI-3 RUBBER MODIFIED WITH OLIGODIENES

Moscow KAUCHUK I REZINA in Russian No 10, Oct 83  
(manuscript received 8 Feb 83) pp 11-13

ZYUZIN, A. P., LANOVSKAYA, L. M., KAVUN, S. M. and YEVSSTRATOV, V. F.,  
Scientific Research Institute for Tire Production

[Abstract] Modification of protector resins based on SKI-3 oligodienes with end isocyanate or hydrazide groups improves fatigue properties but also raises the dynamic module, the coefficient of internal friction and hysteretic losses; increased heat related to the latter seriously damages use characteristics. The present article presents results of research aimed at removing these drawbacks, using cooligomers of butadiene and isoprene in an 80:20 ratio with and without end functional groups, and oligodiene dihydrazide based on SKI-GD isoprene with CONHNH<sub>2</sub> end groups. In mixing, the composition SKI-3 was added at 0', and the oligomer and industrial carbon at 1', while the vulcanizing groups were added in the second stage of mixing at 75-85°C. Formation of additional bonds between the rubber and industrial carbon during specific adsorption improved elastic hysteretic properties. Such an effect was studied for strengthening promoters as well. Results showed that the content of bound rubber in filled mixtures based on SKI-3 modified with n-nitrosodiphenylamine either was unrelated to the introduction of polymers or was somewhat increased over that of the control mixture that contained no oligomer. Rubbers with oligodienediisocyanate had improved elastic hysteretic properties. Competing adsorption on the carbon surface was a major cause of improved properties. Figure 1; references 6: 5 Russian, 1 Russian translation from English.  
[52-12131]

## EFFECTIVENESS OF MODIFICATION OF RESIN POWDER BY EPOXIED OLIGODIENES

Moscow KAUCHUK I REZINA in Russian No 10, Oct 83  
(manuscript received 12 Apr 82) pp 16-19

IZYUMOVA, V. I., ZAKHAROV, N. D., SHAKH-PARON'YANTS, A. M. and KOSHEL', N. A.,  
"YaPI" [expansion unknown; perhaps Yaroslavl Polymer or Polytechnic  
Institute??]

[Abstract] Guided changes in properties of resins containing pulverized vulcanization residues were studied to determine the effectiveness of oligodienes with epoxy groups, based on cis-1,4-polybutadiene (ESKDN-N), containing up to 12 distributed epoxy groups and numerous double bonds. Results showed that treating resin powder with the ESKDN-N oligomer increased durability and fatigue resistance. Swelling in toluene with 10-15% epoxy groups somewhat decreased the thickness of the secondary vulcanized lattice, but when epoxy groups were increased to 20% the lattice thickness equalled that of the control composition. Lengthening the duration of heating, especially near vulcanization temperature, brought growing consumption of the epoxy groups. The prevailing reaction was not homopolymerization, but reaction of epoxyoligodiene with resin particles. The means of introducing the epoxy-oligomer into the mixture had a significant impact on the properties of protector resins. Analysis of physicomechanical parameters of vulcanized rubbers showed that use of the test-modified resin powder improved durability and fatigue resistance, and the epoxied oligomer based on cis-1,4-polybutadiene was judged to be a promising mix modification. Figures 4; references 16 (Russian).  
[52-12131]

## EFFECT OF RADIAL PLAY AND LOAD ON CHANGES IN RADIAL FORCE IRREGULARITIES IN TIRES

Moscow KAUCHUK I REZINA in Russian No 10, Oct 83  
(manuscript received 17 Apr 82) pp 22-25

KULICHKIN, V. F., Yaroslavl Tire Plant

[Abstract] Radial tire irregularities and resulting use variables such as radial load and play are commonly assessed on equipment such as a turning drum with surface variations. Such equipment, however, is not standardized, so that test results are not dependable, and tire imbalance provides another uncontrolled variable. The main reason for inconsistent results in such tire measurements, however, comes from principal variation in measuring radial play and radial force irregularities throughout the entire tire-support contact zone. The author presents data on such measurements using a passenger car tire test rig supplemented by a circular diagram recording system. The

system presented provides a comprehensive picture of radial play and radial force irregularities that can be compared by computer for various tires. Under heavy loads the curve of radial force changes was found to diverge from radial play values due to unequal stiffness in tire walls; this irregularity was more pronounced as tire-wall stiffness became less regular. With lesser loads, results were consistent in repeated tests. Significant changes in initial phase harmonics that form radial force irregularities were observed as load was increased; the lack of consistent measurements indicates the need for further development of test stands. Figures 6; references 4: 2 Russian, 1 Western, 1 Russian translation from English. [52-12131]



## WATER TREATMENT

UDC 628.543.66.065.2

### REMOVAL OF PETROLEUM PRODUCTS FROM WASTE WATERS BY ELECTROCOAGULATION

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA  
TEKHNOLOGIYA in Russian Vol 26, No 8, Aug 83  
(manuscript received 24 Sep 81) pp 964-967

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[Abstract] Studies were conducted on the effectiveness of electrocoagulation in the removal of petroleum product pollutants from waste waters, using axle-grease-contaminated water in test studies. Studies with water samples with a pH of 7.5 at 20°C and variable current supply to the iron electrodes of the electrolytic cell showed that at 5 mA/cm<sup>2</sup> the concentration of the pollutant could be reduced to 0.1 mg/liter, which is below the maximum permissible level of 0.3 mg/liter. A key factor in the effectiveness of this process is the rate of Fe(OH)<sub>2</sub> formation at the anode and the formation of heterocoagulation particles between the Fe(OH)<sub>2</sub> and the petroleum pollutants. Figures 4; references 10 (Russian).  
[31-12172]

UDC 662.741.3.022:622.794.3

### MAGNETIC FIELD APPLICATION TO IMPROVE PROPERTIES OF RECYCLED WATER IN COKE-CHEMICAL PRODUCTION AND EFFECTIVENESS OF HEAT EXCHANGE EQUIPMENT OPERATIONS

Moscow KOKS I KHIMIYA in Russian No 10, Oct 83 pp 38-41

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[Abstract] Magnetic fields have been used effectively in heat exchange equipment to breakup rigid salt deposits in the pipelines. In the present paper experimental data is reviewed concentrating on physical-chemical properties of industrial waters at the coke-chemical plants, reporting

laboratory studies of the effect of magnetic field on precipitation of salts from industrial waters and the results of magnetic treatment of water under industrial conditions. It is concluded that introduction of magnetic equipment would be an advantageous step; it would aid in prevention of new salt deposits, assist in clean-up of old precipitations, thus lowering physical labor and improve overall heat exchange operations, leading to labor and cost savings. Figure 1; references 3 (Russian).  
[53-7813]

UDC 628\*3:543.06.001.2

DETERMINING HYDROLYSIS PLANT WASTE WATER POLLUTION BY ABSORPTION OF LIGHT  
IN ULTRAVIOLET REGION OF SPECTRUM

Moscow GIDROLIZNAYA I LESOKHIMICHESKAYA PROMYSHLENNOST' in Russian No 6,  
Sep 83 pp 17-18

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[Abstract] The relationship between optical density at 250 nm and chemical oxygen demand (COD) was studied using post-fermentation mash from the Leningrad experimental industrial hydrolysis plant. No correlation was seen between the measured parameters for the untreated mash due to its variable chemical composition and the variable presence of sugars and other non-UV absorbing substances. When the mash was biologically purified in a laboratory aeration tank, the coefficient of correlation between optical density and COD was 0.80. Purifying the mash using carbon or alumina adsorbents resulted in a linear relationship between optical density and COD over short intervals. The proportionality constant depended on the purification method and the wavelength (250, 280 or 300 nm) chosen, and was not constant at high levels of purification on carbon. If the mash was purified with hydrogen peroxide, deviation from linearity was seen at 50% purification. When biologically-purified mash was further treated with carbon or alumina, a linear relationship was observed between optical density and COD. The results indicate that UV spectroscopy can be used to evaluate the pollution of hydrolysis factory waste water. Figures 3; references 4: 3 Russian, 1 Western.  
[7-12126]

UDC 634.0.861.19

STUDY OF POTENTIAL UTILIZATION OF SPENT OXYGEN-ALKALI CELLULOSE BLEACHING LIQUOR IN PRODUCTION OF FODDER YEAST

Riga KHIMIYA DREVESINY in Russian No 5, Sep-Oct 83  
(manuscript received 1 Jul 82) pp 72-75

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[Abstract] Organic materials removed from wood during production of cellulose represent a valuable crude material for the manufacturing of fodder protein. Additionally, this process removes potential environmental pollutants. Biochemical processing of spent oxygen-alkali cellulose bleaching liquor (ABL) was studied in mixtures with traditional yeast production substrates: wood hydrosylate, prehydrolysate of sulfate pulping and sulfite liquor. Three yeast strains were studied: *Candida tropicalis* 14, K-2, *Candida scottii* Tul-1, and *Trichosporon cutaneum* LK-22. Cultivation experiments showed that OBLA led to considerable increase of the biomass. For each ton of the wood, a 16-46 kg increase in dry yeasts yield was obtained. The use of OBLA led to substantial increases in the yield of final product, lowered the use of neutralizing agents and eliminated the need for fresh water. Figure 1; references 7 (Russian).  
[40-7813]

STUDY OF RADIATION-DISINTEGRATED WOOD, PART 4: EFFECT OF  $\gamma$ -RADIATION ON COMPOSITION OF ASPEN WOOD AND ITS DIGESTIBILITY BY RUMINANTS

Riga KHIMIYA DREVESINY in Russian No 5, Sep-Oct 83  
(manuscript received 23 Mar 82) pp 83-87

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[Abstract] The effect of materials obtained from  $\gamma$ -irradiated aspen wood on physiological functions of lactating cows was investigated. It was shown that radiation-chemical changes occurring in the wood were accompanied by destruction of macromolecular structures of hydrocarbon and lignin complexes accompanied with increased solubility of their components in aqueous and ethanol-benzene solutions. This in turn increased digestibility and nutritional value of dry substance of the irradiated wood. Qualitative and isomeric composition of water-soluble saccharides of the irradiated aspen was similar to that of the untreated control. Cows fed the preparations from irradiated aspen wood showed increased blood levels of hemoglobin and sugar, increased reserves of alkalinity and normalized calcium/phosphorus ratios. Figure 1; references 15: 13 Russian, 2 Western.  
[40-7813]

INTERACTION OF MEDIA pH CHANGE RATE, TITRANT CONSUMPTION AND ENZYME PRODUCTIVITY IN YEAST CULTIVATION

Moscow GIDROLIZNAYA I LESOKHIMICHESKAYA PROMYSHLENNOST' in Russian No 6, Sep 83 pp 5-7

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[Abstract] Interaction of pH change, titrant-consumption and enzyme-productivity was studied using K. scotii KC-2 at pH 4.2 and 39°C. The titrant was 2-3 N ammonium hydroxide, added automatically. An expression was derived for biomass concentration in terms of medium dilution, percent nitrogen in the biomass, buffer capacity, pH change rate, permitted by the pHstat, and time between titrant additions. Titrant-consumption was found to be directly proportional to productivity and time between titrant additions inversely proportional. The experimental and calculated biomass concentrations demonstrated satisfactory agreement. When acetic acid was used as a carbon source, pH was constant for seven hours. Using a hydrolysate containing formic and acetic acids in the medium, the content of ammonium nitrogen in the post-fermentation mash was found to increase with the quantity of unutilized organic acids until washing rate exceeded dilution

rate. Titrant-consumption on hydrolysate containing medium was less than on synthetic medium. The interrelationship between enzyme-productivity, titrant-consumption and pH change-rate was the same on synthetic and hydrolysate media. Figures 5; references 6: 5 Russian, 1 Western.  
[7-12126]

UDC 630\*863.5.002.2:656/261

#### PROBABILITY OF THERMAL SPONTANEOUS COMBUSTION OF NUTRIENT YEAST IN SOFT CONTAINERS

Moscow GIDROLIZNAYA I LESOKHIMICHESKAYA PROMYSHLENNOST' in Russian No 6, Sep 83 pp 8-9

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[Abstract] The safety of transporting and storing nutrient yeast in soft containers is strongly affected by the fire safety characteristics of the storage containers. The minimum temperature of the medium at which spontaneous combustion arises ( $t_c$ ) is a function of the specific surface of the container and the time required before spontaneous combustion of the yeast. The four empirical constants in the equations derived for  $t_c$  have been determined. The safe temperature is taken as 80% of  $t_c$ . The safe temperature for the containers used for transporting yeast ranges from 80.0°C to 90.8°C, while the interval from the start of heating to spontaneous ignition is from 355 to 1820 hours. The data indicate that yeast in soft containers may be safely transported in open railroad cars and stored on open platforms.  
[7-12126]

UDC 630\*866.5:547.596/.599.001.4

#### DEVELOPMENT OF CONTINUOUS PROCESS FOR CAMPHENE FORMYLATION

Moscow GIDROLIZNAYA I LESOKHIMICHESKAYA PROMYSHLENNOST' in Russian No 6, Sep 83 pp 15-17

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[Abstract] The simultaneous, continuous formylation of camphene and mixture rectification were studied. Using a laboratory fractionating column, formic

acid was pumped into the middle of the column, while unreacted starting materials were collected in a dephlegmator, separated in a heated florentine and returned to the fractionating column. The isobornyl formate formed was removed continuously. It was found that increasing the reaction zone to thirteen theoretical plates and increasing the effectiveness of the fractionating portion of the column to nine theoretical plates increased the degree of camphene transformation to 99%. Using equimolar amounts of camphene and formic acid gave the best quality ester. To accelerate the reaction, 4-8 fold excess formic acid was recycled into the reaction zone. When the excess formic acid exceeded four fold the proportion of isocamphyl formate formed increased. On the basis of the laboratory results obtained, pilot industrial scale-up was conducted. Apparatus productivity was 340-400 kg/m<sup>2</sup>hr. The product was of slightly higher quality than that obtained by the batch process. After 321 hours of operation, OT4 and VTI-0 titanium exhibited the best corrosion resistance. The results indicate that continuous camphene formylation without catalyst is recommended. Figures 1; references 3 (Russian).  
[7-12126]

ENERGETICS AND MAXIMUM KPD OF CHEMICAL HF- AND DF-CO<sub>2</sub> IMPULSE LASERS

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[Abstract] In the present study all of the available data on the energetics of HF-CO<sub>2</sub> and DF-CO<sub>2</sub> lasers were reviewed and analyzed by a unified approach applying the kinetic law governing chemical reactions in lasers and using a quantity  $\Omega$  introduced by us: the factor of heat chain reaction acceleration. Preliminarily, an analysis of a bilevel semiempirical HF laser kinetic reaction model was performed. The model was found to agree with experimental data at  $\Delta < 2$ ; close to the explosion threshold ( $1 < \Delta < 2$ ) additional processes of energy spread had to be considered. Analysis of experimental material showed a relationship between the chemical reaction kinetics as described by the  $\Omega$  quantity and the values of specific energy loss and maximum KPD of the conversions. Optimal reaction conditions were found and it was shown that maximal KPD values for the conversion of photoinitiation energy into laser radiation could reach 1000-2000%. Figures 4; references 40: 25 Russian, 15 Western.  
[42-7813]

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